The Shashtras and Science

ત્રિફળા

Dr. Deep Narayan Pandey
Dr. V. B. Mishra

Published by
Yajurvid ayurveda
for Global Common Good

Yajurvid Ayurveda

Caution: This is an academic document. Any Ayurvedic medicine or rasayanas including Triphala should be used only in consultation with an Ayurveda doctor.

Cover page design: ***Pushp Deep Pandey****, Isplash Creative Consulting*

अनुक्रमाणिका

प्राक्कथन

त्रिफला भारत में सबसे अधिक खरीदी जाने वाली आयुर्वेदिक औषधियों में से एक है। जाति, धर्म, निवास स्थान, जलवायु एवं भौगोलिक परिस्थितियों से ऊपर उठ कर प्रत्येक घर में त्रिफला की कुछ न कुछ मात्रा अवश्य पाई जाती है। आयुर्वेद का ऐसा कोई ग्रन्थ नहीं जिसमें त्रिफला को एक उच्चकोटि का रसायन न माना गया हो। भारत के पांच लाख आयुर्वेदाचार्यों में ऐसा कोई नहीं जिसने त्रिफला को अपनी चिकित्सा में प्रयुक्त न किया हो। चरकसंहिता, सुश्रुतसंहिता, अष्टांगहृदय सहित आयुर्वेद के सभी ग्रन्थों में त्रिफला पर उपलब्ध ज्ञान का निचोड़ यह है कि त्रिफला न केवल सभी प्रकार की बीमारियों के विरुद्ध उपयोगी है, बल्कि यह प्रायः सभी प्रकार की बीमारियों को रोकने के लिये एक विशिष्ट और प्रभावी रसायन भी है।

आधुनिक विज्ञान में त्रिफला पर हुये शोध बताते हैं कि यह अनेक गैर-संचारी रोगों जैसे हृदय रोग, कैन्सर, मधुमेह, मनोरोग, श्वसन-तंत्र के रोगों आदि की रोकथाम में रसायन और औषधि के रूप में महत्वपूर्ण भूमिका निभाता है। त्रिफला शरीर के ऑक्सीडेटिव स्ट्रेस को कम करते हुये फ्री-रेडीकल स्केवेंजिंग तथा पीड़ा या प्रदाह कम करते हुये हमारे स्वास्थ्य की रक्षा करता है। इसका उपयोग मुख्य रूप से एडॉप्टोजेनिक, इम्यूनोमोड्यूलेटर, एंटीऑक्सिडेंट, ज्वरनाशक, एनाल्जेसिक, जीवाणुरोधी, अनेक प्रकार के कैंसर रोकने वाला, ट्यूमर-विकास-रोधी, एंटीम्यूटाजेनिक, घाव भरने, दन्तक्षयरोधी, तनावरोधी, अनुकूलक, हाइपोग्लिसीमिक, डायबिटीजरोधी, कीमोप्रोटेक्टिव, रेडियोप्रोटेक्टिव, कीमोप्रिवेंटिव, रेचक, भूख-वर्धक, गैस्ट्रिक एसिडिटी-रोधी जैसे कार्य-प्रभाव हेतु होता है। त्रिफला का रसायन के रूप में प्रभाव डालने की प्रक्रिया मुख्य रूप से फ्री-रेडीकल स्केवेंजिंग तो है ही, साथ ही एंटी-ऑक्सीडेंट एंजाजाइम्स को बढ़ावा देना, लिपिड पेरोक्सीडेशन को रोकना, पीड़ाशामक, स्नायु-तंत्र का कायाकल्प आदि भी होते हैं।

इस सबके बावजूद आयुर्वेदाचार्यों और आतुर दोनों को भरोसा दिलाने में छक्के छूट जाते हैं कि त्रिफला कब्ज का चूरन नहीं, एक श्रेष्ठतम रसायन है। जीवन भर स्वस्थ रहना चाहते हैं तो प्रमाण-आधारित बात यह है कि ऑक्सीडेटिव स्ट्रेस और इनफ्लेमेशन के निरापद प्रबंध के लिये आयुर्वेद की रसायन चिकित्सा से बेहतर कोई और चिकित्सा पद्धति विश्व में ज्ञात नहीं है। कुल मिलाकर जनमानस में त्रिफला के बारे में जो धारणा बनी हुई है कि यह केवल पाचन-तंत्र के रोगों को ठीक करता है, सही नहीं है। वस्तुतः आयुर्वेद में कोई औषधि या रसायन सर्वप्रथम अग्नि को सम करता है जिसे हम सब प्रायः शीघ्रता से अनुभव कर लेते हैं। किन्तु अन्य लाभ हम प्रायः देख नहीं पाते।

हाल ही में त्रिफला के बारे में 1200 से अधिक आयुर्वेदाचार्यों के मध्य किये गये एक सर्वेक्षण के निष्कर्षों को अब तक प्रकाशित शोधपत्रों के प्रकाश में देखने पर ज्ञात होता है कि ऐसे लोगों का

प्रतिशत नगण्य ही है जो स्वास्थ्य-रक्षण के लिये वर्षों से त्रिफला का सेवन करते रहे हों, और फिर भी गैर संचारी रोग जैसे हृदय रोग, मधुमेह, कैन्सर, मानसिक रोग आदि से पीड़ित हो गये हों। त्रिफला के शास्त्र-वर्णित एवं शोध-समर्थित गुणों का तुलनात्मक अध्ययन बताता है कि त्रिफला विविध प्रकार के रोगों से बचाव कर सकता है, बशर्ते खान-पान एवं जीवन-शैली संयमित व संतुलित हो, और त्रिफला की गुणवत्ता से समझौता न किया गया हो।

यहाँ त्रिफला से संबंधित ऐसी ही महत्वपूर्ण जानकारियाँ समाहित की गयी हैं। पहले अध्याय में त्रिफला का आयुर्वेद के श्रेष्ठ रसायन व औषधि के रूप में विश्लेषण दिया गया है। अध्याय 2 में त्रिफला के घटक, उपयोग व क्रियात्मकता पर प्रकाश डाला गया है। अध्याय 3 में त्रिफला को कुछ आचार्यों द्वारा भोजन के अंग के रूप में माने जाने का विश्लेषण है। अध्याय 4 में यह सलाह दी गयी है कि चिकित्सकीय परामर्श से ही त्रिफला लेना सुरक्षित व लाभकारी है। अध्याय 5 में यह विचार-विमर्श है कि त्रिफला जैसे द्रव्यों पर पर आयुर्वेदाचार्यों के अनुभवजन्य ज्ञान का एकत्रीकरण और आपस में साझा करना बहुत उपयोगी हो सकता है।

इसके साथ ही त्रिफला पर प्रकाशित कुछ क्लिनिकल ट्रायल्स पर जानकारी तथा प्रकाशित शोधपत्रों की सूची भी पुस्तक के अंत में दिये गये हैं। आशा है कि त्रिफला पर आगे शोध हेतु जो आयुर्वेदाचार्य और शोधार्थी रुचि रखते हैं, उन्हें मदद मिल सकेगी।

वस्तुतः प्रत्येक अध्याय के लेखन हेतु उस विधि का प्रयोग हुआ है जो इस प्रकार के विश्लेषणों की सर्वमान्य तथा वैश्विक स्तर पर विद्वानों के मध्य स्वीकार्य विधि है। शास्त्र, साइंस और अनुभव के साथ कोई समझौता न करते हुये भी भाषा की सहजता का ध्यान रखा गया है। प्रत्येक अध्याय से संबंधित विषय के वर्णन में आयुर्वेद के 5000 साल के इतिहास में उपलब्ध संस्कृत साहित्य का अनुशीलन, आयुर्वेद और औषधीय पौधों पर विश्व की सर्वाधिक प्रतिष्ठित शोध पत्रिकाओं में प्रकाशित लगभग 1,50,000 शोधपत्रों के डेटाबेस में से त्रिफला से संबंधित विषय पर प्रकाशित शोध को भी सार-रूप में यथावत समाहित किया गया है। तत्पश्चात अनुभवजन्य ज्ञान को समाहित किया गया है। इसके साथ ही प्रत्येक अध्याय को फीडबैक के लिये देश के लगभग 1200 आयुर्वेदाचार्यों के मध्य रखकर उनके विचार आमंत्रित किये जाकर, जितनी भी टिप्पणियाँ और फीडबैक मिले, उनको समाहित करते हुये एक समग्र-दृष्टिकोण युक्त अध्याय प्रस्तुत किया गया है। आयुर्वेद के इस महत्वपूर्ण द्रव्य त्रिफला के विविध तकनीकी और गूढ़ वैज्ञानिक पहलुओं पर विश्लेषण तैयार करने की यह उत्तम विधि मानी जाती है। आशा की जाती है कि संहिताओं, वैज्ञानिक शोध, अनुभवजन्य ज्ञान के समेकित बौद्धिक संगम पर किये गये इस अनूठे प्रयोग का लेखा-जोखा पाठकों को रोचक और उपयोगी लगेगा।

आशा है इस जानकारी का उपयोग प्रबुद्ध पाठकगण, आयुर्वेदाचार्यों के चिकित्सकीय परामर्श से, अपनी आयु को हितकारी एवं सुखकारी बनाने में करेंगे। जैसा कि सर्वविदित है कि केवल ज्ञान की

उपलब्धता स्वास्थ्य में सुधार नहीं ला सकती। ज्ञान को कार्य से जोड़ना और जीवन में आत्मसात करना आवश्यक है। आयुर्वेद में ज्ञान तो बहुत उपलब्ध है पर भारतीय समाज ने इस ज्ञान को ऐसा भुलाया कि आज भारत अनेक रोगों की वैश्विक राजधानी बनता जा रहा है। त्रिफला पर यहाँ प्रस्तुत जानकारी भारत को इन समस्याओं से मुक्त करने में आयुर्वेदाचार्यों की थोड़ी भी मदद कर सके, तो उत्तम होगा।

1
त्रिफला रसायन और औषधि

1. प्रस्तावना

भारत में 200 साल पहले बायो-मेडिसिन आने के पूर्व, लगभग 5000 साल तक, आयुर्वेद ही प्रमुख चिकित्सा पद्धति रही है। तब न केवल बीमार व्यक्तियों का उपचार किया जाता है, अपितु स्वस्थ व्यक्ति को स्वस्थ रखने की विस्तृत और लोकप्रिय विधा प्रचलन और प्राथमिकता में रही है। आज भी लगभग 70 प्रतिशत भारतीय कभी न कभी आयुर्वेदिक औषधियों पर किसी न किसी रूप में निर्भर हैं, परन्तु तथाकथित मॉडर्न मेडिसिन आने के पश्चात स्वस्थ व्यक्तियों के स्वास्थ्य की रक्षा का उद्देश्य लगभग भुला दिया गया है। भारत में आयुर्वेद की अवहेलना ने कथित आधुनिक चिकित्सा पद्धति को बीमारों का एक दुधारू अंतर्राष्ट्रीय बाज़ार दे दिया है। और अब, आयुर्वेद की रसायन चिकित्सा की उपेक्षा से बढ़ रहे रोगी, और उनसे मिल रहे धन से प्रायोजित विज्ञापनों ने, इतना चकाचौंध कर दिया कि हम सार्वजनिक, पारिवारिक और व्यक्तिगत स्वास्थ्य के विरुद्ध हो रहे इस प्रज्ञापराध को देखने के बावजूद नहीं देखते। कम से कम 5000 वर्षों तक भारतीय समाज की निरंतर सेवा करने वाला त्रिफला जैसा अमृत भी इसी छल-कपट का शिकार हो रहा है।

त्रिफला आज भी भारत में सबसे अधिक खरीदी जाने वाली आयुर्वेदिक औषधियों में गिना जाता है। अनुभवजन्य ज्ञान यह भी बताता है कि जाति, धर्म, निवास स्थान, जलवायु एवं भौगोलिक परिस्थितियों से ऊपर उठ कर प्रत्येक घर में त्रिफला की कुछ न कुछ मात्रा अवश्य पाई जाती है। आयुर्वेद का ऐसा कोई ग्रन्थ नहीं जिसमे त्रिफला को एक उच्चकोटि का रसायन न माना गया हो। भारत के पांच लाख आयुर्वेदाचार्यों में ऐसा कोई वैद्य नहीं जिसने त्रिफला को अपनी चिकित्सा में प्रयुक्त न किया हो। चरक संहिता, सुश्रुत संहिता, अष्टांगहृदय सहित अन्य ग्रन्थों के निचोड़स्वरूप यह कहा जाता है कि त्रिफला न केवल सभी तरह की बीमारियों की औषधि है, बल्कि यह सभी प्रकार की बीमारियों को रोकने के लिये एक विशिष्ट और प्रभावी रसायन भी है। आयुर्वेद की दृष्टि में जरा-व्याधि का नाश करने वाले, स्वास्थ्यकर व ओजस्कर द्रव्य को रसायन जानना चाहिये।[1] त्रिफला यह कार्य प्रभावी रूप से करता है।

2. आयुर्वेद में रसायन एवं सर्वरोगहर के रूप में त्रिफला

---

[1] **रसायनं च तज्ज्ञेयं यज्जराव्याधिनाशनम्।**
ज्ञेयं रसायनं तच्च स्वस्थस्योर्जस्करं च यत्॥

त्रिफला सेवन से धातु, रस, अग्नि तथा स्रोत सब पर धनात्मक प्रभाव पड़ता है। यहाँ केवल कुछ उद्धरण ही पर्याप्त होंगे। घी, मधु, गुड़ या तैल के साथ प्रयोग करने पर केवल अकेला द्रव्य त्रिफला ही सभी रोगों का शमन कर सकता है[2]। इसी प्रकार शीतकाल में सोंठ और गुड़ के साथ, ग्रीष्मकाल में खांड और दूध के साथ, और वर्षाकाल में सोंठ के साथ त्रिफला सेवन करने पर सभी रोग समाप्त होते हैं[3]।

त्रिफला को रसायन के रूप में उपयोग पर चरकसंहिता, सुश्रुतसंहिता, अष्टांगहृदय सहित सभी महत्वपूर्ण ग्रंथों में दिशानिर्देश हैं। तिमिर रोग से पीड़ित व्यक्ति को त्रिफला चूर्ण को खीर में मधु तथा खांड मिलाकर कई माह प्रातःकाल लेने से या भोजन के पूर्व प्रतिदिन हरीतकी चूर्ण मुनक्का, खांड या मधु के साथ लेने से लाभ होता है[4]। नेत्रों की रक्षा के लिये पुराने जौ, गेहूँ, शालिधान्य, साठीधान्य, कोदो के चावल, मूंग जैसे पदार्थों को पर्याप्त घी मिलाकर या घी में बनाकर कफ-पित्तनाशक इन खाद्य-पदार्थों को लेना चाहिये। अम्ल पदार्थों में अनार, मीठे में मिश्री, नमक में सैन्धव, फलों में त्रिफला व दाख, और पेय में वर्षा का साफ़ जल उपयोग करना चाहिये। छाता-टोपी और जूता-मोजा भी उपयोग किया जाना चाहिये और समय समय पर दोष-शोधन भी करना चाहिये[5]। त्रिफला का मुलेठी के साथ, वंशलोचन के साथ, पीपल के साथ, सैन्धव लवण के साथ, रजत-भस्म के साथ, लोहे के भस्म के साथ, स्वर्ण भस्म के साथ, वंग भस्म के साथ, अथवा खांड के साथ मिलाकर मधु और घी में फेंटकर बने रसायन को प्रतिदिन एक वर्ष तक लेने से सब रोगों का हनन होता है और मेधा, आयु, स्मृति व

---

[2] घृतान्विता वा मधुनान्विता वा, गुडान्विता तैल्समन्विता वा।
एका हि नित्यं मनुजैःप्रयोज्या, सर्वामयानां शमनी महार्थी॥ (भारत भैषज्य रत्नाकर 2553-2554)
[3] सशीतकाले गुडनागरेण, सशर्कराक्षीरयुता तथोष्णे।
वर्षासु शुण्ठीसहिता फलत्रिका, त्रिफला सर्वरुजाहरा स्यात्॥
[4] पायसं वा वरायुक्तं शीतं समधुशर्करम्।
प्रातर्भक्तस्य वा पूर्वमद्यात्पथ्यां पृथक् पृथक्॥
मृद्वीकाशर्कराक्षौद्रैः सततं तिमिरातुरः॥ (अ.हृ.उ. 13.18-19)
[5] सर्वदा च निषेवेत स्वस्थोऽपि नयनप्रियः।
पुराणयवगोधूमशालि षष्टिककोद्रवान्॥
मुद्गादीन् कफपित्तघ्नान् भूरिसर्पिःपरिप्लुतान्।
शाकं चैवंविधं मांसं जाङ्गलं दाडिमं सिताम्।
सैन्धवं त्रिफलां द्राक्षा वारि पाने च नाभसम्॥
आतपत्रं पदत्राणं विधिवद्दोषशोधनम्। (अ.हृ.उ. 17.61-63)

बुद्धि में बढ़ोत्तरी होती है[6]। आचार्य चरक ने भी समान निर्देश दिया है।[7] आचार्य सुश्रुत ने भी त्रिफला को सभी रोगों को समाप्त करने वाला बताया है[8]। यहाँ एक बहुत उपयोगी योग यह है कि हरीतकी, बिभीतकी, और आमलकी को बराबर मात्रा में लेकर, एक तिहाई मात्रा घी में भूनकर व चूर्ण बनायें। यह त्रिफला सब रोगों का हनन करता है। इसे सदैव लेने से जवानी भी स्थिर होती है।

रोचक बात यह है कि धार्मिक ग्रंथों में, जहाँ प्रायः दैव-व्यपाश्रय के आधार पर चिकित्सा के परामर्श की पूरी उम्मीद रहती है, उनमें भी त्रिफला को युक्ति-व्यपाश्रय या रेशनल मेडिसिन के अनुरूप महत्त्व दिया गया है। गरुड़पुराण का एक उदाहरण देखिये।[9] यहाँ भी त्रिफला को मधु या गुड़ सभी रोगों के उपचार में उपयोगी कहा गया है। त्रिफला, त्रिकटु (सोंठ, काली मिर्च, पिप्पली), शतावरी, गुडूची, या विडंग आदि के साथ भी सभी रोगों का हनन करता है। इसी प्रकार अग्निपुराण[10] में भी कथन है कि त्रिफला, मधु, शर्करा, घी, कालीमिर्च आदि के साथ सभी रोगों का नाश करता है।

त्रिफला को भोजन के अंग के रूप में भी माना गया है। यों तो स्वाद बदलने के लिये कभी-कभार सभी खाद्य-पदार्थ खाये जा सकते हैं, परन्तु निरंतर या रोजमर्रा-भोजन पर आचार्य वाग्भट द्वारा अष्टांगहृदय में दी गयी सलाह बड़े काम की है।[11] शालिधान्य, गेहूं, जौ, साठी चावल, वनों में मिलने

---

[6] मधुकेन तवक्षीर्या पिप्पल्या सिन्धुजन्मना।
पृथग्लोहैः सुवर्णेन वचया मधुसर्पिषा॥
सितया वा समा युक्ता समायुक्ता रसायनम्।
त्रिफला सर्वरोगघ्नी मेधायुःस्मृतिबुद्धिदा॥ (अ.हृ.उ. 39.43)

[7] मधुकेन तुगाक्षीर्या पिप्पल्या क्षौद्रसर्पिषा।
त्रिफला सितया चापि युक्ता सिद्धं रसायनम्॥
सर्वलौहैः सुवर्णेन वचया मधुसर्पिषा।
विडङ्गपिप्पलीभ्यां च त्रिफला लवणेन च॥
संवत्सरप्रयोगेण मेधास्मृतिबलप्रदा।
भवत्यायुःप्रदा धन्या जरारोगनिबर्हणी॥ (च.चि.1.1.45-47)

[8] त्रिफला सर्वरोगघ्नी त्रिभागघृतमूर्च्छिता।
वयसः स्थापनं चापि कुर्यात् संततसेविता॥ (सु.सू. 44.71-72)

[9] एवं विज्ञाय रोगादींश्चिकित्सामथ वै चरेत्।
त्रिफला सर्वरोगघ्नी मध्वाज्यगुडसंयुता॥
सव्योषा त्रिफला वापि सर्वरोगप्रमर्दिनी।
शतावरीगुडूच्यग्निविडङ्गेन युताथवा॥ (ग.पु. आचारकाण्ड, अध्याय 167, श्लोक 57-58)

[10] त्रिफला सर्वरोगघ्नी समधुः शर्क्करान्विता॥
सितामधुघृतैर्युक्ता सकृष्णा त्रिफला तथा। (अग्निपुराण, तृतीयखंड, 282.44)

[11] शीलयेच्छालि गोधूमयवषष्टिकजाङ्गलम्।
पथ्यामलकमृद्वीकापटोलीमुद्ग शर्कराः॥

वाले खाद्य, हरड़, आमला, दाख-मुनक्का, परवल, मूंग, खांड, घी, वर्षा का स्वच्छ जल, दूध, मधु, अनार, सैन्धव लवण, और आँखों की ताक़त बढ़ाने के लिये रात में मधु और घी के साथ त्रिफला का सेवन किया जाना चाहिये। इसके साथ ही स्वास्थ्य की रक्षा के लिये या रोगों से मुक्ति के लिये जो भी उपयोगी आहार हो उसे लिया जा सकता है।

नियमित भोजन में ऐसे द्रव्यों को भी थोड़ी मात्रा में शामिल किया जा सकता है जो आहार, रसायन और औषधि, तीनों ही प्रकारों में वर्गीकृत हैं। त्रिफला इनमे से एक है। अन्य पदार्थों में विविध-प्रकार व विविध-रंगों वाले स्थानीय मौसमी फल, खजूर, द्राक्षा ,मुनक्का, बादाम, तिल, आँवला, लहसुन, सोंठ, कालीमिर्च, पिपली, हल्दी, केसर, जीरा, धनिया, शहद, एवं गुड़ आदि ऐसे द्रव्य हैं जिनका थोड़ा सेवन उपयोगी रहता है।

3. त्रिफला की क्रियात्मकता

आयुर्वेद में रसायनों के विविध प्रकार हैं। त्रिफला इन सब रसायनों में न केवल बनाने में सबसे आसान है, अपितु तीनों प्रजातियों के फल, हरीतकी या हरड़, बिभीतकी या बहेड़ा तथा आमलकी या आँवला सम्पूर्ण भारतवर्ष में मिलते हैं। तीनों प्रजातियाँ पृथक-पृथक भी रसायन गुणों से भरपूर हैं, और मिलकर एक ऐसे संतुलित द्रव्य का निर्माण करती हैं जो अनेक रोगों को रोक सकने में सक्षम है। हरीतकी और बिभीतकी उष्णवीर्य और आमलकी शीतवीर्य होने से मिल-जुलकर संतुलित त्रिफला रसायन का निर्माण होता है। त्रिफला वात, पित्त व कफ तीनों ही दोषों का शमन करते हुये ओज़ की वृद्धि करता है, धातुओं को पुष्ट करता है एवं जरा-व्याधि का नाश करता है। इनमें हरीतकी द्वारा मुख्यतया वात, आमलकी द्वारा पित्त तथा बिभीतकी द्वारा कफ का शमन होता है। इस सन्दर्भ में आचार्य वाग्भट का कथन है कि हरीतकी रस में कषाय, विपाक में मधुर, गुण में रुक्ष व लघु, लवण-रस-रहित, अग्निवर्धक, पाचन, मेधावर्धक, यौवन को स्थिर रखने में श्रेष्ठ, वीर्य में उष्ण, रेचक, आयु के हितकर, बुद्धि व इन्द्रियों के लिये बलप्रद है; कुष्ठ, कान्तिहीनता, स्वरभेद, जीर्णज्वर, विषमज्वर, शिरोरोग, नेत्ररोग, पान्डुरोग, हृदयरोग, कामला, ग्रहणीरोग, शोषरोग, शोथ, अतिसार, मेदोदोष या मोटापा, मोह या मूर्छा, छर्दि, कृमि, श्वास, कास, प्रसेक या स्राव आदि, अर्श, प्लीहारोग, आनाह, गरविष, उदररोग, स्रोतो-विबंध, गुल्मरोग, उरुस्तम्भ, अरोचक, तथा इन जैसे कफ वात जनित रोगों को समाप्त करती है।[12] आमलकी भी हरीतकी के सामान गुणधर्म-युक्त है, परन्तु वीर्य में शीत एवं अम्ल-रस-प्रधान,

---

घृतदिव्योदकक्षीर क्षौद्र दाडिमसैन्धवम्।
त्रिफलां मधुसर्पिर्भ्यां निशि नेत्रबलाय च॥
स्वास्थ्यानुवृत्तिकृद्यच्च रोगोच्छेदकरं च यत्। (अ.ह.सू. 8.42-43):

[12] कषाया मधुरा पाके रूक्षा विलवणा लघुः॥
दीपनी पाचनी मेध्या वयसः स्थापनी परम्।
उष्णवीर्या सराऽयुष्या बुद्धीन्द्रियबलप्रदा॥

और पित्त व कफ दोषों को नष्ट करती है। बिभीतकी भी हरीतकी के सामान किन्तु विपाक में कटु एवं वीर्य में उष्ण तथा बालों के लिये हितकारी है और हरड़ से कुछ न्यून गुण वाली है। उक्त तीन फलों का योग त्रिफला है जो रसायनों में श्रेष्ठ, नेत्ररोगनाशक, व्रणरोपण, त्वचाविकार, क्लेद या सड़न, मेदोदोष या मोटापा, प्रमेह, कफरोग व रक्तरोग नष्ट करता है।

हालांकि, त्रिफला में इन तीनों फलों को एक निश्चित अनुपात में मिलाये जाने के निर्देश शास्त्रों में मिलते हैं, किंतु एक भाग हरीतकी, दो भाग बिभीतकी और चार भाग आमलकी से बना त्रिफला आयुर्वेदाचार्यों द्वारा बेहतर बताया गया है। छाया में सुखाये गये तीनों प्रजातियों के फलों से गुठली हटाकर समुचित अनुपात में मिलाकर पाउडर या चूर्ण बनाया जाता है तथा आयुर्वेदाचार्यों की सलाह से निश्चित अनुपान के रूप में दूध, घी, शहद, शीतल या उष्ण जल, या गुड़ के साथ लिया जा सकता है। क्वाथ बनाने के लिये एक भाग चूर्ण को 16 भाग जल में उबालते हुये आठवां हिस्सा बचने पर छान कर अनेक व्याधियों में उपयोग किया जाता है। आयुर्वेद के सिद्धान्तों के अनुसार त्रिफला को अन्य द्रव्यों के साथ मिलाते हुये लगभग 1700 प्रकार की क्लासिकल और प्रोप्राइटरी औषधियां निर्मित की जा रहीं हैं। आयुर्वेद का कथन है कि त्रिफला का सेवन यदि एक वर्ष तक किया जाये तो यह निरोगी रखते हुये शतायु बनाने की क्षमता रखता है।

4. त्रिफला में वैज्ञानिक शोध

आधुनिक विज्ञान में त्रिफला पर हुये शोध का निष्कर्ष भी यही है कि यह अनेक गैर-संचारी रोगों जैसे हृदय रोग, कैन्सर, मधुमेह, मनोरोग, श्वसन-तंत्र के रोगों आदि की रोकथाम में रसायन और औषधि के रूप में महत्वपूर्ण भूमिका निभाता है। त्रिफला शरीर के ऑक्सीडेटिव स्ट्रेस को कम करते हुये फ्री-रेडीकल स्केवेंजिंग तथा पीड़ा या प्रदाह कम करते हुये हमारे स्वास्थ्य की रक्षा करता है। वैज्ञानिक शोध से के बाद लिखे गये कम से कम 250 शोधपत्रों से यह भी ज्ञात हुआ है कि त्रिफला में अभी तक 174 बायोएक्टिव द्रव्य पाये गये हैं, हालांकि अनुमान है कि कुल द्रव्यों की संख्या 3500 से

कुष्ठवैवर्ण्यवैस्वर्यपुराणविषमज्वरान्।
शिरोऽक्षिपाण्डुहृद्रोगकामलाग्रहणीगदान्॥
सशोषशोफातीसारमेदमोहवमिकृमीन्।
श्वासकासप्रसेकार्शःप्लीहानाहगरोदरम्॥
विबन्धं स्रोतसां गुल्ममूरुस्तम्भमरोचकम्।
हरीतकी जयेद्व्याधींस्तांस्तांश्च कफवातजान्॥
तद्वदामलकं शीतमम्लं पित्तकफापहम्।
कटु पाके हिमं केश्यमक्षमीषच्च तद्गुणम्॥
इयं रसायनवरा त्रिफलाऽक्ष्यामयापहा।
रोपणी त्वग्गदक्लेदमेदोमेहकफास्रजित्॥ (अ.हृ.सू.6.151-157)

अधिक हो सकती है। डॉ. भूषन पटवर्धन और उनके साथी वैज्ञानिकों द्वारा त्रिफला नेटवर्क फार्माकोलॉजी का अध्ययन बताता है कि 31 प्रोटीन-लक्ष्यों के मॉडुलेशन के माध्यम से त्रिफला कम से कम 15 रोग प्रकारों और 74 रुग्णता-संकेतकों के विरुद्ध प्रभावी है। इनमे मुख्य रूप से एडॉप्टोजेनिक, इम्यूनोमोड्यूलेटर, एंटीऑक्सिडेंट, ज्वरनाशक, एनाल्जेसिक, जीवाणुरोधी, अनेक प्रकार के कैंसर रोकने वाला, ट्यूमर-विकास-रोधी, एंटीम्यूटाजेनिक, घाव भरने, दन्तक्षयरोधी, तनावरोधी, अनुकूलक, हाइपोग्लिसीमिक, डायबिटीजरोधी, कीमोप्रोटेक्टिव, रेडियोप्रोटेक्टिव, कीमोप्रिवेंटिव, रेचक, भूख-वर्धक, गैस्ट्रिक एसिडिटी-रोधी जैसे कार्य-प्रभाव शामिल हैं। त्रिफला का रसायन के रूप में प्रभाव डालने की प्रक्रिया मुख्य रूप से फ्री-रेडीकल स्केवेंजिंग तो है ही, साथ ही एंटी-ऑक्सीडेंट एंजाजाइम्स को बढ़ावा देना, लिपिड पेरोक्सीडेशन को रोकना, पीड़ाशामक, स्नायु-तंत्र का कायाकल्प आदि भी होते हैं।

त्रिफला वह सब कार्य करता है, जो आचार्य सुश्रुत द्वारा परिभाषित स्वास्थ्य[13] के अनुसार व्यक्ति को स्वस्थ बनाते हैं। इनमें वात, पित्त, कफ, अग्नियों, धातुओं व मल-क्रिया का संतुलित होना, और आत्मा, इन्द्रियों व मन का प्रसन्न होना निहित है। विश्व स्वास्थ्य संगठन द्वारा दी गयी परिभाषा भी लगभग समान है: स्वास्थ्य न केवल रोग या दुर्बलता की अनुपस्थिति अपितु पूर्ण शारीरिक, मानसिक और सामाजिक खुशहाली की स्थिति है। रसायन के रूप में त्रिफला वह सब करता है जिसे आचार्य चरक ने रसायन सेवन के प्रभावों के सन्दर्भ में स्पष्ट किया है।[14] स्पष्ट है कि रसायन दीर्घ-आयु, स्मरण-शक्ति, मेधा, आरोग्य, तरुणाई, चमकदार शरीर, मोहक रंग, उदार-स्वर, शरीर और इन्द्रिय में परम बल, विलक्षण वाणी, शिष्टाचार, कान्ति आदि प्राप्त करने का उपाय है। तात्पर्य यह कि त्रिफला जैसे रसायनों के सेवन से मन, प्राण और शरीर के स्वास्थ्य और सौन्दर्य का निखार स्थायी होने लगता है। इसके साथ ही रसायन और औषधि होने के नाते त्रिफला आयुर्वेद के दोनों मूल उद्देश्यों, स्वस्थ व्यक्ति के स्वास्थ्य की रक्षा और पीड़ित व्यक्ति के विकार का शमन,[15] की पूर्ति में सहायक है।

5. जनमानस में त्रिफला के प्रति भ्रान्ति

इस सबके बावजूद यह भी एक सत्य है कि छक्के छूट जाते हैं आतुर को भरोसा दिलाने में कि त्रिफला कब्ज की दवा का चूरन नहीं, एक श्रेष्ठतम रसायन है। जीवन भर स्वस्थ रहना चाहते हैं तो प्रमाण-

---

[13] समदोषः समाग्निश्च समधातु मलक्रियः।
प्रसन्नात्मेन्द्रियमनाः स्वस्थइत्यभिधीयते॥ (सु.सू. 15.41)
[14] दीर्घमायुः स्मृतिं मेधामारोग्यं तरुणं वयः।
प्रभावर्णस्वरौदार्यं देहेन्द्रियबलं परम्॥
वाक्सिद्धिं प्रणतिं कान्तिं लभते ना रसायनात्।
लाभोपायो हि शस्तानां रसादीनां रसायनम्॥ (च.चि. 1.7-8)
[15] स्वस्थस्य स्वास्थ्यरक्षणम् आतुरस्य विकारप्रशमनम्॥ (च.सू. 30.26)

आधारित बात यह है कि ऑक्सीडेटिव स्ट्रेस और इनफ्लेमेशन के निरापद प्रबंध के लिये आयुर्वेद की रसायन चिकित्सा से बेहतर कोई और चिकित्सा पद्धति विश्व में ज्ञात नहीं है। कुल मिलाकर जनमानस में त्रिफला के बारे में जो धारणा बनी हुई है कि यह केवल पाचन-तंत्र के रोगों को ठीक करता है, सही नहीं है। वस्तुतः आयुर्वेद में कोई औषधि या रसायन सर्वप्रथम अग्नि को सम करता है जिसे हम सब प्रायः शीघ्रता से अनुभव कर लेते हैं। किन्तु अन्य लाभ हम प्रायः देख नहीं पाते।

यहाँ पुनः यह बताना उपयोगी है कि त्रिफला के बारे में 1200 से अधिक आयुर्वेदाचार्यों के मध्य किये गये एक सर्वेक्षण के निष्कर्षों को अब तक प्रकाशित या संदर्भित 1400 से अधिक शोधपत्रों के प्रकाश में देखने पर प्रमाणित होता है कि ऐसे लोगों का प्रतिशत सांख्यिकीय रूप से नगण्य ही है जो स्वस्थ होने के बावजूद कुछ वर्षों से त्रिफला का सेवन करते रहे हों, और फिर भी गैर संचारी रोग जैसे हृदय रोग, मधुमेह, कैन्सर, मानसिक रोग आदि से पीड़ित हो गये हों। त्रिफला के शास्त्र-वर्णित एवं शोध-समर्थित गुणों का तुलनात्मक अध्ययन बताता है कि त्रिफला विविध प्रकार के रोगों से बचाव कर सकता है, बशर्ते खान-पान एवं जीवन-शैली संयमित व संतुलित हो, और त्रिफला की गुणवत्ता से समझौता न किया गया हो।

6. त्रिफला और हीरक भस्म (वज्र भस्म) जैसी रस-औषधियों के मध्य समानता

एक महत्वपूर्ण बात यह है सर्वरोगहर या सर्वरोगघ्नी, जिसका असल में तात्पर्य बहुत से रोगों के विरुद्ध प्रभावी मानना उचित होगा, होने के कारण त्रिफला का स्थान योगराज, शिलाजतुवटी, और गुडूची-लौह के साथ ही रसशास्त्र की सर्वाधिक प्रभावी औषधियों वज्र-भस्म, अभ्रक-भस्म, अभ्र मारण निश्चन्द्रिक आदि की श्रेणी में आ जाता है।

आयुर्वेदाचार्यों के एक समूह का मानना है कि त्रिफला के लिये "सर्वरोगहर" की उपमा शाब्दिक अर्थों में नहीं ली जानी चाहिये। अपितु, आयुर्वेद के मूल प्रयोजन की दृष्टि से दोषसाम्य, धातुसाम्य, मलसाम्य कर व्यधिक्षमत्व उत्पन्न करते हुये सर्वरोगहर की श्रेणी में तो रखा ही जा सकता है। जब कोई द्रव्य प्रायः उपयोगी होता है तो उसे प्रभावी मान लिया जाता है। ऐसा त्रिफला के लिये भी मान लेना समुचित होगा। त्रिफला सभी रोगों की चिकित्सा में सहायक औषधि के रूप में प्रयुक्त हो सकता है, हालाँकि सर्वरोगहर नहीं कहा जा सकता। वस्तुतः इस औषधि में इतने अधिक गुण हैं कि यह लगभग हर रोग में काम में ली जा सकती है। यही कारण है कि आचार्यों ने इसे सर्वरोगघ्न कह दिया है। इस विचार से भिन्न एक विचार भी है। आयुर्वेद में त्रिदोष की विषमता रोगों का कारण है। चिकित्सक किसी भी युक्ति से दोषों की साम्यता करता है, और इसे ही चिकित्सा कहते हैं। यदि निदान सटीक है तो अकेले त्रिफला से दोषों को साम्य किया जा सकता है। बशर्ते त्रिफला का निर्माण उच्चकोटि के द्रव्यों से किया गया हो और तीनों द्रव्यों की मात्रा भी उसी अनुपात जिसमें दोषसाम्यता की जानी हो।

जिन रोगों पर सर्वरोगहर रसौषाधियाँ—यथा अभ्रक भस्म, वज्र भस्म, पारद के योग, लोकनाथ रस, अग्नि रस, लोह रसायन आदि—प्रभावी हैं परन्तु रोगी इन्हें लेने में आर्थिक रूप से सक्षम नहीं है, और जब शास्त्रीय वर्णन व नवीन शोध से त्रिफला की सर्वरोगहर के रूप में उपयोगिता सिद्ध हो चुकी है, तो निश्चित रूप से त्रिफला को विहित किया जा सकता है। प्रायः यह देखा जा रहा है कि अभी आयुर्वेदाचार्यों की प्राथमिकता रस-औषधियों को विहित करने में होती है। सर्वरोगहर कहने का तात्पर्य यह नहीं माना जाना चाहिये कि सभी रोगों की चिकित्सा हेतु अनिवार्यतः केवल त्रिफला का ही प्रयोग किया जाये। तथापि, त्रिफला की उपयोगिता प्रमाणित हो जाने के बावज़ूद आयुर्वेदाचार्य त्रिफला के प्रयोग में प्रायः नेत्र, खालित्य, पालित्य, व कब्ज से आगे नहीं बढ़ते।

7. निष्कर्ष

निष्कर्ष रूप में कहा जा सकता है कि आयुर्वेद की संहिताओं एवं आधुनिक विज्ञान के इन-वाइवो, इन-वाइट्रो एवं कई क्लीनिकल ट्रायल्स दोनों में ही त्रिफला को अनेक रोगों से बचाव एवं उपचार में लाभकारी पाया गया है। हालांकि त्रिफला पर आगे अध्ययन की आवश्यकता तो है, किंतु 250 से अधिक उच्चकोटि के वैज्ञानिक शोधपत्रों का निष्कर्ष यही सिद्ध करता है कि त्रिफला भोजन, रसायन एवं औषधि तीनों ही रूपों में महत्वपूर्ण द्रव्य है जिसे आप अपने आयुर्वेदाचार्य की सलाह से जीवन भर स्वस्थ बने रहने के लिये उपयोग में ले सकते हैं।

2
त्रिफला के घटक, उपयोग व क्रियात्मकता

1. आमलकी

त्रिफला का एक घटक आमलकी है। शास्त्र व शोध एकमत हैं कि आयु-आधारित रोगोत्पत्ति रोकने में आँवला श्रेष्ठ रसायन है। सन्दर्भ-विशेष में अर्थ यह है कि आमलकी या आँवला आयु को स्थिर करने वाले द्रव्यों में श्रेष्ठतम है।[1]वयःस्थापन का शब्दिक अर्थ तो उम्र को स्थिर करना है, तथापि आयुर्वेद के विशाल संस्कृत वांग्मय में वयःस्थापन शब्द विस्तृत और सार्वभौमिक अर्थ समाहित करता है। इसका एक भाव यह है कि आमलकी ग्रहण करने से उम्र का स्थायित्व प्राप्त होता है, या उम्र का बढ़ना रुक जाता है। निहितार्थ यह भी है कि बढ़ती उम्र के बावजूद शरीर में आयु-आधारित-व्याधिजनन या तो रुक जाता है या गति धीमी हो जाती है। आयु-आधारित व्याधिजनन या ऐज-रिलेटेड पैथोजेनेसिस समकालीन विश्व की सबसे गंभीर समस्या है जिससे बायो-मेडिकल साइंस अभी तक पार नहीं पा सका है। दूसरे अर्थ में वयःस्थापन का तात्पर्य युवावस्था, तरुणाई या जवानी के स्थायित्व के प्रसंग में देखा गया है। निहितार्थ यह है कि वयःस्थापक रसायनों का प्रयोग शरीर को कान्तिवान, पुष्ट, स्थिर एवं प्रसन्न बनाये रखता है। जैसा कि आचार्य चरक ने कहा है[2], रसायन दीर्घ-आयु, स्मरण-शक्ति, मेधा, आरोग्य, तरुणाई, चमकदार शरीर, मोहक रंग, उदार-स्वर, शरीर और इन्द्रिय में परम बल, विलक्षण वाणी, शिष्टाचार, कान्ति आदि प्राप्त करने का उपाय है। सौन्दर्य विज्ञान की भाषा में कहें तो मन, प्राण और शरीर के स्वास्थ्य और सौन्दर्य का निखार स्थायी होने लगता है।

आमलकी, जिसे आँवला या धात्रीफल भी कहा जाता है, यदि इतना उपयोगी पदार्थ माना गया है तो शास्त्र, विज्ञान और अनुभव, तीनों ही स्रोतों में एतदर्थ उपलब्ध प्रमाण परखना आवश्यक है, कि क्या "***आमलकं वयःस्थापनानाम्***" का सिद्धान्त शास्त्रीय जानकारी, वैज्ञानिक ज्ञान और अनुभव-जन्य ज्ञान में खरा उतरता है? पहली बात यह है कि कम से कम पांचवी शताब्दी ईसा पूर्व से लेकर वर्त्तमान काल तक लिखित या संकलित आयुर्वेद की संहिताओं और ग्रंथों के निचोड़ के आधार पर यह कहना

---

[1] आमलकं वयःस्थापनानाम् श्रेष्ठम् (च.सू. 25.40) चरकसंहिता का एक महावाक्य है। अनेक शताब्दियों बाद आचार्य वाग्भट ने इसी वाक्य को वयसः स्थापने धात्री (अ.ह्र.उ. 40.56) दोहराया है।

[2] दीर्घमायुः स्मृतिं मेधामारोग्यं तरुणं वयः।
प्रभावर्णस्वरौदार्यं देहेन्द्रियबलं परम्।।
वाक्सिद्धिं प्रणतिं कान्तिं लभते ना रसायनात्।
लाभोपायो हि शस्तानां रसादीनां रसायनम्।। (च.चि. 1.7-8)

उचित है कि आयुर्वेद का ऐसा कोई ग्रन्थ नहीं जिसने आमलकी को एक उच्चकोटि का भोजन, प्रभावी रसायन और महत्वपूर्ण औषधि के रूप में मान्यता नहीं प्रदत्त की हो। चरक, सुश्रुत, वाग्भट, सारंगधर, भावमिश्र, चक्रपाणि, आदि आचार्यों द्वारा लिखित संहिताओं और ग्रंथों का सारांश रोचक है। चरकसंहिता के अनुसार आँवला में लवण रस के अतिरिक्त सभी रस हैं। अम्लरस-प्रधान, रुक्ष, मधुर, कषाय है। परम कफ-पित्त नाशक, वृष्य या पुरुषत्व-वर्धक, रसायन, तथा गुल्म, उदर, ज्वर, पांडु, अतिसार, प्रमेह, कामला, कृमि आदि रोगों के विरुद्ध उपयोगी है। सुश्रुतसंहिता के अनुसार रक्त-पित्तशामक, नेत्र ज्योति बढ़ाने वाला, पुरुषत्व-वर्धक रसायन है। भावप्रकाश निघंटु के अनुसार यह पुरूषत्व बढ़ाने वाला, रसायन एवं रक्त-पित्त-हर, गुल्महर और प्रमेहहर है। धन्वन्तरि निघंटु के अनुसार पुरूषत्व-वर्धक, रसायन, ज्वरहर, तथा स्त्रीरोगों में लाभकारी है। राजनिघंटु के अनुसार आमलकी रक्त-पित्त-हर है। इस सम्बन्ध में भावप्रकाश में वर्णित गुणधर्म देखना उपयोगी है आँवला हरीतकी की भांति है, विशेषकर रक्त-पित्त-प्रमेहहर, पुरुषत्ववर्धक व रसायन है। अपने अम्ल रस व शीत वीर्य द्वारा वात का शमन और शुष्कता और कषाय के द्वारा कफ शमन करता है। इस प्रकार तीनों दोषों के शमन में विजयी होता है।[3] आचार्य वाग्भट ने आमलक रसायन का वर्णन करते हुये लिखा है कि आमले का रस, शहद, खण्ड, तथा घी मिलाकर प्रतिदिन चाटते रहने से जरा-जन्य-विकार ठीक उसी प्रकार नष्ट हो जाते हैं, जैसे बेमन से पढ़े गये ग्रन्थ भूल जाते हैं।[4] इसी प्रकार आँवले का वाजीकारक, अर्थात वृष्य या पुरुषत्व-वर्धक योग भी निर्दिष्ट है।[5] आचार्य सुश्रुत ने भी कहा है कि आँवला स्वरस से अच्छी तरह भावित आँवला-चूर्ण में, खण्ड, मधु व घी मिलाकर लेने और बाद में दूध पीने से व्यक्ति अस्सी साल की उम्र में भी युवा की तरह रहता है।[6]

---

[3] हरीतकीसमं धात्रीफलं किन्तु विशेषतः।
रक्तपित्तप्रमेहघ्नं परं वृष्यं रसायनम्।।
हन्ति वातं तदम्लत्वात्पित्तं माधुर्यशैत्यतः।
कफं रूक्षकषायत्वात्फलं धात्र्यास्त्रिदोषजित्।। (भा.प्र.पूर्वखण्ड 6.2.39-40)

[4] धात्रीरसक्षौद्र सिताघृतानि हिताशनानां लिहतां नराणाम्।
प्रणाशमायान्ति जराविकारा ग्रन्था विशाला इव दुर्गृहीताः।। (अ.हृ.उ. 39.149)

[5] कृष्णाधात्रीफलरजः स्वरसेन सुभावितम्।
शर्करामधुसर्पिर्भिर्लीढ्वा योऽनुपयःपिबेत्।।
स नरोऽशीतिवर्षोऽपि युवेव परिहृष्यति। (अ.हृ.उ. 40.27)

[6] एवमामलकं चूर्णं स्वरसेनैव भावितम्।
शर्करामधुसर्पिर्भिर्युक्तं लीढ्वा पयः पिबेत्।।
एतेनाशीतिवर्षोऽपि युवेव परिहृष्यति। (सु.चि. 26.24-25)

पारंपरिक उपयोगों में आमलकी का उपयोग पुरुषत्व बढ़ाने, भूख बढ़ाने, अपच एवं अजीर्ण कम करने, बुखार कम करने, केश वृद्धि, उल्टी, सिरदर्द तथा श्वसन की समस्यायें दूर करने एवं महिलाओं में योनि-जलन को दूर करने में उपयोग किया जाता रहा है।

शास्त्रों में आँवला कम से कम 400 औषधि योगों का एक अंग तो है ही, साथ ही 2000 से अधिक प्रोपराईटरी औषधियों में भी यह महत्वपूर्ण घटक के रूप में लिया गया है। सारांश यह है कि शास्त्रों में "***आमलकं वयःस्थापनानाम्***" के सिद्धान्त को खण्डित करने के लिये न केवल कोई प्रमाण उपलब्ध नहीं है, बल्कि आज तक उत्तरोत्तर इस सिद्धांत का पुष्टीकरण ही हुआ है।

आमलकी में कार्बोहाइड्रेड, प्रोटीन, वसा, फाईबर, आयरन, मेग्नीशियम, फास्फोरस, पोटेशियम, कैल्शीयम, कॉपर, निकोटनिक एसिड आदि रासायनिक संघटक हैं। इसके अतिरिक्त अनेक फिनोलिक कम्पाउंड्स, टेनिन आदि पाये जाते हैं। गेलिक ऐसिड व क्वेर्सीटिन जैसे पदार्थ केवल फल में ही पाये जाते हैं।

आधुनिक विज्ञान की दृष्टि से यदि देखा जाये तो यह सिद्ध करने के लिये कि आमलकी आयु को स्थिर करने वाला द्रव्य है, प्रमाणों के दो अलग-अलग समूह देखना आवश्यक है। प्रथम समूह यह कि कोई भी द्रव्य जो जीवन को सुरक्षित रख सकता है, उसमें दो गुण होना अनिवार्य है: पहला, फ्री-रेडीकल स्केवेंजिंग के द्वारा ऑक्सीडेटिव स्ट्रेस को कम करना एवं, दूसरा, एन्टीइन्फ्लेमेटरी गुण का होना। इन दोनों गुणों के कारण ही कोई द्रव्य बढ़ती हुई उम्र के कारण लगने वाले रोगों से लड़ सकता है। प्रमाणों के दूसरे समूह में सीधे इस बात को देखना है कि उम्र के कारण होने वाली बीमारियों को रोकने एवं हो जाने पर उपचार करने की शक्ति आमलकी में है या नहीं। फ्री-रेडीकल स्केवेंजिंग एवं एन्टीइन्फ्लेमेटरी गुण के सन्दर्भ में आमलकी उच्चकोटि का रसायन एवं एडॉप्टोजेन होने के कारण दोनों ही प्रभाव पर्याप्त आधुनिक शोध में सिद्ध हुये हैं। बढ़ती उम्र की गैरसंचारी बीमारियों जैसे कैंसर, डायबिटीज हृदय रोग, अपर श्वसन तंत्र के रोग, मानसिक रोग एवं इन रोगों के कारण होने वाली द्वितीयक-जटिलताओं को रोकने के प्रमाण भी हैं। इस दिशा में विश्व भर में आमलकी पर गंभीर अध्ययन हुये हैं। मुख्य रूप से प्रयोगशाला-उपकरणों के द्वारा इन-वाइट्रो तथा विभिन्न प्रजातियों के प्राणियों में इन-वाइवो अध्ययनों पर 250 से अधिक शोध पत्र प्रकाशित हो चुके हैं। इन सबसे सिद्ध हुआ है कि आमलकी में एंटीऑक्सीडेंट, इम्यूनोमोड्यूलेटर, हिपेटोप्रोटेक्टिव, कार्डियोप्रेटेक्टिव, रीनोप्रोटेक्टिव, एंटीडायरियल, एंटीएमेटिक, एन्टीकैंसर, एन्टीडायबेटिक, एन्टीइन्फ्लेमेटरी, एन्टीहाइपरटेंसिव, न्यूरोप्रोटेक्टिव, एंटीएथीरोस्क्लीरोटिक, एन्टीवायरल, ऐन्टीप्रोलीफेरेटिव, एन्टीपायरेटिक, एनलजेसिक, एन्टीमाइक्रोबियल, एन्टीएलर्जिक, एन्टीहापरलिपिडेमिक, एंटीहाइपरथायरॉयडिज्म, एल्डोज रिडक्टेज इनहिबिटर, प्रोटीन काइनेज इनहिबिटर, गेस्ट्रोप्रोटेक्टिव, स्मृतिवर्धक, एन्टीअल्जीमर, एन्टीकेटरेक्ट आदि गुण हैं। विश्व की सर्वाधिक महत्वपूर्ण शोध-पत्रिकाओं

में आमलकी पर 1750 से अधिक शोध पत्र प्रकाशित हो चुके हैं। इन शोध पत्रों में इन-वाइट्रो और इन-वाइवो अध्ययनों के अलावा कुछ क्लीनिकल ट्रायल्स भी हैं जो निर्विवाद रूप से आँवला में रसायन गुणों को प्रमाणित करते हैं। इसका तात्पर्य यह हुआ कि आँवला के गुणधर्मों पर शास्त्रीय सिद्धांतों एवं साइंटिफिक अध्ययनों के निष्कर्षों में पूर्ण समानता है। त्रिफला नामक उपयोगी रसायन में भी आमलकी एक महत्वपूर्ण हिस्सा है। हालाँकि अभी क्लिनिकल ट्रायल्स कि आवश्यकता है, परन्तु अभी तक के अध्ययनों में त्रिफला के रोगरोधी या प्रोफायलैक्टिक तथा रोगोपचारी या थेराप्यूटिक गुणधर्म का शास्त्रों और साइंस में निर्विवाद प्रमाणीकरण हुआ है।

इस विश्लेषण से यही सिद्ध होता है कि आचार्य चरक द्वारा 2000 वर्ष पूर्व प्रतिपादित सिद्धांत पूर्णतः विज्ञान-सम्मत सिद्धांत है।[7]

यही कारण है कि आमलकी न केवल औषधि एवं रसायन के रूप में आयुर्वेद में सदैव प्रयुक्त होता आया है, बल्कि आहार के रूप में भारत के रसोईघरों में चटनी, आचार, मुरब्बा जैसे इतने रूपों में प्रयुक्त होता है कि इस पर कई ग्रंथ लिखे जा चुके हैं। इन सब तथ्यों के कारण भूले-बिसरे आँवले को अपने भोजन का अंग बनाने के लिये हमारा उत्साहित होना स्वाभाविक है। त्रिफला में इसका उपयोग तो है ही। हाँ, कुछ बातें ध्यान में रखना महत्वपूर्ण है। पहली बात तो यह है कि आमलकी के रस का उपयोग जहाँ तक संभव हो ताजा ही उचित रहता है। रस का भण्डारण करने पर गुणों में कमी आती है। दूसरी बात यह है कि वृक्षों से कच्चे फल तोड़ने के बजाय परिपक्व फल ही उपयोग में लिये जाने चाहिये। तीसरी बात यह है कि यदि आप आँवले को सुखा कर रखना चाहते हैं तो छाया में ही सुखायें और फंगस व बैक्टीरिया आदि से बचाने के लिये सुरक्षित व वायुरोधी बर्तनों में ही रखें। आवश्यकता अनुसार शुष्क फलों से चूर्ण बनायें। चौथी बात यह है कि यदि आँवले की खेती की जा रही है तो वृक्षों को नगरीय-मल-जल या औद्योगिक उच्छिष्ठ-जल का उपयोग कर सिंचाई में कदापि नहीं किया जाये, ताकि आँवले के फलों को भारी-धातुओं के प्रदूषण से बचाया जा सके। और अंत में, यदि आप आँवले को त्रिफला बनाने के लिये या एकल औषधि के रूप में प्रयोग करना चाहते हैं तो अपने आयुर्वेदाचार्य से परामर्श अवश्य करें एवं उनकी पूर्व-सलाह के अनुरूप आहार-विहार एवं औषधि का प्रयोग करने में ही अपनी भलाई समझें। औषधियों के मामले में अपनहँथा-जगन्नथा की उक्ति नहीं, बल्कि आयुर्वेद का युक्ति-व्यपाश्रय सिद्धांत ही उचित है, और इसे समझना और उपयोग का निर्देश देना आयुर्वेदाचार्यों के ही बस की बात है।

2. हरीतकी

[7] **आमलकं वयःस्थापनानाम् (च.सू. 25.40), जिसे आचार्य वाग्भट द्वारा वयसः स्थापने धात्री (अ.ह.उ. 40.56) कहा गया|**

आमलकी और बिभीतकी के साथ ही हरीतकी, त्रिफला का एक घटक है। आयुर्वेद की सहायता से आयु-आधारित बीमारियों की रोकथाम हेतु हरीतकी श्रेष्ठ पथ्य, रसायन व औषधि है। हरीतकी को आयुर्वेद की प्राचीन संहिताओं में पथ्यकारी, रसायन व उत्कृष्ट औषधि माना गया है। फलों की बनावट के आधार पर हरीतकी या हरड़ को विजया, रोहिणी, पूतना, अमृता, अभया, जीवन्ती व चेतकी नामक 7 प्रकारों में वर्गीकृत किया गया है। यूनानी चिकित्सा में इसे प्रायः हलेलह-स्याह (सूखकर काली हो गयी हरड़), हलेलह-ज़र्द (अधपकी पीले रंग की हरड़), और हलेलह-काबुली (पूर्ण परिपक्व हरड़) में वर्गीकृत किया जाता है।

हरीतकी और आमलकी लगभग समान गुण वाली प्रजातियाँ हैं। हरीतकी कषाय रस प्रधान तथा आमलकी अम्ल रस प्रधान द्रव्य है। हरीतकी में भी आमलकी की तरह लवण रस को छोड़कर शेष सभी पाँच रस पाये जाते हैं। यह उष्णवीर्य, त्रिदोषनाशक, मधुरविपाक लघु तथा रसायन है। हरीतकी का उपयोग रसायन एवं पथ्य के रूप में तो होता ही है, साथ ही श्वास, कास, प्रमेह, अर्श, शोफ, कुष्ठ, ग्रहणी, हृदय रोग, उदर रोग, मूत्र रोग, त्वचा रोग, विषम ज्वर, मुख रोग, अल्सर, उल्टी, दस्त, उदर-पीड़ा आदि अनेक रोगों को उपचारित करने में भी यह उपयोगी है। यूनानी मेडिसिन में इसे ठंड तथा सूखी माना जाता है और इसका उपयोग आँखों एवं दिमाग के टॉनिक के रूप में, डायरिया, अर्श, लकवा, सिरदर्द, मिर्गी, याददाश्त, रक्तशोधक, अर्श एवं कुष्ठ आदि के सन्दर्भ में होता है। आश्चर्यजनक बात यह है कि हरीतकी के बारे में 2000 वर्ष पूर्व आयुर्वेद की संहिताओं में अंकित तथ्य, आधुनिक वैज्ञानिक शोध में भी यथावत सिद्ध पाये गये हैं।

वस्तुतः हरीतकी एक उत्कृष्ट रसायन और प्रभावी औषधि है। राजबल्लभ निघण्टु में वर्णित एक लाक्षणिकता बहुत मनोहारी है।[8] कहा गया है कि जिसकी माँ घर पर न हो, उसकी माँ हरीतकी है। माता तो कभी-कभी नाराज भी हो सकती है, परन्तु उदरस्थ हरड़ कभी भी हानिकारक नहीं होती। इसी प्रकार मदनपाल निघण्टु में द्दष्टव्य है कि हरीतकी नाम इसलिये पड़ा, क्योंकि यह सब रोगों का नाश करती है।[9] आचार्य वाग्भट ने अष्टांगहृदय में भी हरीतकी को बहुत उपयोगी माना है[10] इसके अतिरिक्त भी ऋतुओं, रोगों और परिस्थितियों के अनुसार, आयुर्वेदाचार्यों की सलाह से, हरीतकी को गुड़, शहद, शुंठी, काली मिर्च, सैंधव लवण, मिश्री, या पिपली के साथ ग्रहण करने के अनेक योग

---

[8] यस्य माता गृहे नास्ति, तस्य माता हरीतकी।
कदाचिद् कुप्यते माता, नोदरस्था हरीतकी॥
[9] हरते सर्वरोगांश्च तस्मात् प्रोक्ता हरीतकी॥
[10] गुडेन मधुना शुण्ठ्या कृष्णया लवणेन वा।
द्वे द्वे खादन् सदा पथ्ये जीवेद्वर्षशतं सुखी॥ (अ.हृ.उ. 39.147)

आयुर्वेद की संहिताओं में निर्दिष्ट हैं। संहिताओं में तो बहुत विस्तृत वर्णन है, पर उस सबका निचोड़ आचार्य चरक का यह महावाक्य[11] माना जा सकता है कि पथ्यकारी द्रव्यों में हरीतकी सर्वश्रेष्ठ है।

आधुनिक वैज्ञानिक शोध में हरीतकी को विविध रोगों की आयु-आधारित रोगोत्पत्ति को रोकने एवं उपचार में उपयोगी और सुरक्षित पाया गया है। हरीतकी अब आधुनिक बायोमेडिसिन में भी एक लोकप्रिय औषधि है। यह आयुर्वेद, सिद्ध, यूनानी, होम्योपेथी, ऐलोपेथी, फाइटोमेडिसन आदि पद्धतियों में प्रयुक्त हो रही है और प्रभावी है। हरीतकी स्वतंत्र रूप से आयुर्वेद में रसायन तो है ही, यह त्रिफला के योग के रूप में तथा अन्य विविध औषधियों के साथ जुड़कर एक हजार से अधिक आयुर्वेदिक औषधियों में प्रयुक्त होती है। इसी प्रकार 2000 से अधिक प्रोपराइटरी आयुर्वेदिक औषधियों में यह एक सह-द्रव्य के रूप में प्रयुक्त होती है।

हरीतकी पर आज तक 217 इन-वाइट्रो (लैब में) तथा इन-वाइवो (प्राणियों में) अध्ययन हुये हैं। साथ ही 1000 से अधिक शोधपत्र हैं जहाँ हरीतकी एक सह-द्रव्य है। इनमें से 351 शोधपत्र तो मूलतः हरीतकी पर ही हैं। जैसा कि प्रायः आयुर्वेदिक औषधियों के साथ अभी तक की स्थिति रही है, आयुर्वेदिक चिकित्सा की समग्रता को समाहित करते हुये क्लीनिकल ट्रायल्स बहुत कम हैं। फिर भी, वर्ष 2016 तक 86 क्लीनिकल ट्रॉयल्स या क्लीनिकल स्टडीज प्रकाशित हुये हैं। आधुनिक शोध पर विश्व के महत्वपूर्ण जर्नल्स में प्रकाशित शोध-पत्रों में इन-वाइट्रो, इन-वाइवो एवं क्लीनिकल अध्ययनों का निचोड़ यह है कि हरीतकी में एंटीऑक्सीडेंट, रेडियोप्रोटेक्टिव, कीमोप्रिन्टेटिव, हिपेटोप्रोटेक्टिव, कार्डियोप्रोटेक्टिव, रीनोप्रोटेक्टिव, अडाप्टोजेनिक, हाइपोलिपिडमिक, हाइपोकोलेस्टेरोलिमिक, इम्यूनोमोड्युलेटरी, एंटीबेक्टीरियल, एंटीफंगल, एंटीटीवायरल, एंटीप्रोटोजोअल, एंटीकार्सीनोजेनिक, एंटीम्यूटाजनिक, एंटीडायबिटीज, एंटीइन्फ्लेमेटोरी, एंटीआर्थराईटिस, एंटीअनाफाइलेक्टिक, एंटीअल्सर, एंटीस्पाजमोडिक, एंटीकेरीज, एंटीअल्जीमर, एंटीएलर्जिक, वुंड-हीलिंग, उदर-विकार-रोधी आदि गुण पाये जाते हैं। ये सभी गुण वस्तुतः विविध प्रकार के फाइटोकेमिकल्स, जैसे पोलीफिनाल्स, फ्लेवोनोइड्स, एन्थोसाइन्स, ग्लाइकोसाइड्स, अल्कलोइड्स, टरपीन्स आदि के कारण हैं। इनमें फिनोलिक एसिड श्रेणी के द्रव्यों में एलाजिक एसिड, चेब्यूलिक एसिड, नियोचेब्यूलिक एसिड, गेलिक एसिड, चेव्यूलिनिक एसिड, तथा चेव्यूलाजिक एसिड आदि मुख्य हैं जो हरीतकी को चिकित्सकीय गुण प्रदान करते हैं। इसके अतिरिक्त बेन्जोइक एसिड समूह में हाइड्रोबेन्जोइक एसिड तथा उसके डेरीवेटिव्स, सिनेमिक एसिड समूह हाईड्रोक्सीसिनेमिक एसिड के डेरीवेटिव्स, फ्लेवोनोइड समूह के द्रव्यों में फलेवोनोल एग्लीमोन्स, एमीकोन्स तथा ग्लाइकोसाइड्स इत्यादि विविध चिकित्सकीय भूमिका निभाते हैं।

---

[11] **हरीतकी पथ्यानाम्। (च.सू. 25.40)**

शोध में इस बात के ठोस प्रमाण मिले हैं कि हरीतकी में एंटीऑक्सीडेंट तथा दर्दनाशक गुण हैं। साथ ही, एक अध्ययन में पाया गया है कि एक हज़ार मिलिग्राम हरीतकी की एक खुराक स्वस्थ व्यक्तियों को देने से दर्द सहने की क्षमता बढ़ने के साथ तथा दर्द के प्रारंभ की सीमा बढ़ जाती है। इस प्रकार यह जोड़ों के दर्द, ऑस्टियोआर्थराइटिस, रेम्युटॉइडआर्थराइटिस आदि ऐसे रोगों में विशेष लाभकारी है, जिनमें दर्द एक महत्वपूर्ण लक्षण है। इसके साथ ही हरीतकी-युक्त द्रव्य का एक अन्य क्लिनिकल परीक्षण 130 मोटापा-ग्रस्त लोगों पर किया गया। इसमें भी पाया गया कि यह द्रव्य न केवल मोटापा घटाने में उपयोगी है बल्कि दर्द की स्थिति और लिपिड प्रोफाइल भी सुधरी। एक रैंडमाइज्ड डबल-ब्लाइंड क्लीनिकल परीक्षण के दो सप्ताह तक चले शोध से ज्ञात हुआ है कि हरीतकी के घोल से प्रतिदिन दो बार कुल्ला करने से माइक्रोबियल प्लॉक व जिंजिवल इन्फ्लमेशन कम हुआ तथा मुंह में लार की अम्लीयता-क्षारीयता सम हुई। इसी प्रकार हरीतकी अल्जीमर रोग पर भी उपयोगी पायी गयी है।

आश्चर्यजनक बात यह है कि हरीतकी पर उपलब्ध ज्ञान आयुर्वेद का प्राचीन ज्ञान होने के बावजूद बड़ी संख्या में पेटेंट प्राप्त कर लिये गये हैं। वर्ष 2016 में प्रकाशित एक रिपोर्ट के अनुसार अभी तक 46 पेटेंट में हरीतकी या तो अकेले द्रव्य के रूप में, या हरीतकी से प्राप्त फाइटोकेमिकल्स, या हरीतकी और अन्य द्रव्यों के योगों पर पेटेंट कराये जा चुके हैं। गुणधर्म या प्रभाविता जिसके लिये पेटेंट दिया गया है, उनमें से एक भी ऐसा नहीं है जिसका आयुर्वेद के ग्रन्थों में वर्णन न हो। आदर्श परिस्थितियों में ऐसे उत्पादों को पेटेंट मिलना कठिन होना चाहिये जो प्राचीन या पारम्परिक ज्ञान पर आधारित हैं।

अंततः आयुर्वेदिक संहिताओं, आधुनिक वैज्ञानिक शोध एवं अनुभव-जन्य समझ से यही सिद्ध होता है कि हरीतकी के विविध योग स्वस्थ व्यक्ति के स्वास्थ्य की रक्षा तथा रोगी व्यक्ति को रोग-मुक्त करने में सक्षम हैं। हाँ, इस संभावना को फलीभूत करने हेतु कुछ महत्वपूर्ण कार्य किये जाने आवश्यक हैं। पहली बात तो यह है कि किसी भी ऐसी आयुर्वेदिक औषधि या द्रव्य को, जिसे सुखाकर रखना उपयोगी होता है, उसे छाया में ही सुखाया जाना चाहिये। आद्रता, फंगस, बैक्टीरिया आदि से बचाने के लिये सुरक्षित व वायुरोधी बर्तनों में ही भंडारण किया जाना चाहिये। औषधि का नाम, रूप और उपयोगिता तो बहुत लोग जानते हैं परन्तु बैक्टीरिया, कवक या कीड़ों द्वारा नष्ट औषधि किसी काम की नहीं रहती। अच्छी तरह भंडारित औषधि में से जितनी और जिस रूप में आवश्यकता हो, उसे उसी रूप में उपयोग में लिया जाना चाहिये। दूसरी बात यह है कि भले ही आप हरीतकी का प्रयोग रसायन के रूप क्यों न ले रहे हों, उचित चिकित्सकीय परामर्श के बिना स्वयं-वैद्य बनना अनुपयोगी और हानिकारक हो सकता है। रोगी, रोग, और औषधि का आयुर्वेदाचार्यों द्वारा शास्त्रोक्त व आधुनिक नैदानिक परीक्षण, विचार और तदानुसार सलाह आयुर्वेद के लाभकारी होने की पहली और प्रमुख शर्त है। इस शर्त का पालन करना उचित रहता है।

तीसरी और सबसे महत्वपूर्ण बात यह है कि भारत के प्राकृतिक वन आयुर्वेदिक औषधियों के सतत जैविक उत्पादन का सर्वोत्तम स्रोत हो सकते हैं, बशर्ते सतत प्रबंध किया जाये। इन वनों में हरीतकी, आमलकी एवं बिभीतकी जैसी विविध प्रजातियों के औषधीय वृक्षों, झाड़ियों, लताओं और शाकीय पौधों का भण्डार है। हरीतकी जैसे विशाल वृक्ष तो अभी वनों में ही पाये जाते हैं। अतः वनों के सतत प्रबंध, संरक्षण, संवर्धन और आवश्यकतानुसार पारिस्थितिकीय पुनरुद्धार हेतु स्थानीय लोगों की साझेदारी से दीर्घकालीन व्यवस्थायें लागू किया जाना उपयोगी रहेगा। सतत वन प्रबंध की इन व्यवस्थाओं में स्थानीय जन-समुदाय की साझेदारी उनकी आजीविका सुदृढ़ करने के लिये भी उपयोगी है। स्थानीय समुदाय द्वारा स्थानीय-नियम बनाने, स्थानीय-निगरानी और स्थानीय-प्रवर्तन की शक्ति देने से सतत वन प्रबंध और सुदृढ़ आजीविका के उद्देश्य साथ-साथ पूरे होने की संभावना है। स्थानीय-स्तर पर जन-समुदाय को, सतत वन प्रबंध हेतु अपने स्वयं के नियम बनाने और लागू करने की मजबूत स्वायत्तता व उत्साहवर्धन, वनों से बेहतर उत्पाद और सेवाओं की उपलब्धता सुनिश्चित करने तथा लोगों की आजीविका सुदृढ़ करने में उपयोगी भूमिका निभा सकता है।

3. बिभीतकी

आमलकी एवं हरीतकी के साथ ही बिभीतकी भी त्रिफला का महत्वपूर्ण घटक है। यह बहेड़ा नामक वृक्ष के फलों से गुठली निकाल कर उपयोग में लाया जाता है। इसके पारम्परिक उपयोगों में बिच्छू-डंक, बालों के झड़ने, नेत्रों की समस्याओं, गले की खराबी, खांसी, उल्टी-दस्त, बवासीर, अस्थमा, ब्रोंकाइटिस, पेट के कीड़े आदि समस्याओं के समाधान में उपयोग होता रहा है। आधुनिक शोध से ज्ञात होता है कि इसमें बेलेरीकेनिन नामक ग्लोकासाइड, गेलिक एसिड, एलाजिक एसिड, चेब्यूलेजिक एसिड, बीटा-सिटोस्टीराल, मैनिटोल, ग्लूकोज, फ्रक्टोज आदि फाइटोकेमिकल्स पाये जाते हैं। यही घटक विभीतकी के औषधीय गुणों के लिये उत्तरदायी हैं। शोध से ज्ञात होता है कि बिभीतकी कम से कम 25 प्रकार की क्लिनिकल समस्याओं के विरुद्ध उपयोगी है। इनमें दर्द-निवारण, एंटी-डायरिया, एंटी-हाइपरटेन्सिव, साल्मोनेला-जनित विषाक्तता का उपचार, एंटीस्पॉजमोडिक, ब्रोंकोडायलेटरी, एंटी-माइक्रोबियल, एंटी-आक्सीडेंट, इम्यूनोलॉजिकल कार्य, जख्म भरने में उपयोगी, हिपेटोप्रोटेक्टिव, एंटी-प्लाक, ऐंटी-बॉयोफिल्म, एंटी-कैंसर, बीटालेक्टेमेज इन्हिबिटर, एंटी-अल्सर, एंटी-थ्रोमबोटिक, थ्रोम्बोलाइटिक, एंटी-पायरेटिक, एंटी-म्यूटाजनिक, एंटी-फ्राइबोटिक, एंटीइन्फ्लेमेट्री, इन्सूलिनसिक्रीटागोग (इन्सूलिन स्राव में सुधार), एंटी-डायबिटिक, एंटी-नेफ्रो-टोक्सिसिटी, एंटी-एचआईवी-1, एंटी-फंगल, एंटी-हाईपरलिपिडेमिक, एंटी-हाईपरयूरीसीमिया आदि गुण पाये गये हैं।

हाल ही में हाईपरयूरीसिमिया से पीडित 110 रोगियों पर किये गये एक क्लीनिकल ट्रॉयल से स्पष्ट हुआ है कि सीरम में यूरिक एसिड की मात्रा कम करने में बिभीतकी बहुत उपयोगी है। यह प्रभाव खुराक आधारित है जो 500 मिलिग्राम है। औषधि के रूप में उपयोग किये जाने वाले एक्सट्रेक्ट में

कम से कम 39 प्रतिशत चेब्यूलिक एसिड, चेब्यूलाजिक एसिड तथा अन्य हाइड्रोलाइजेबल टैनिन उपस्थित होना आवश्यक है।

वर्ष 2017 में प्रकाशित शोध से एक तथ्य यह सामने आया है कि बिभीतकी के सूखे फलों को ग्रिल्लिंग या हल्का भून लेने से फ्री रेडिकल स्केवेंजिंग, एंटीलिपिडपेरोक्सीडेशन तथा एंटीबैक्टीरियल प्रभाव बढ़ जाता है। भुने हुये फल 71.72 प्रतिशत तक डायरिया कम करते हैं जबकि गैर भुने हुये फल 41.87 प्रतिशत तक ही डायरिया रोक पाते हैं। रोचक बात यह है कि सीएसआईआर-नेशनल बोटैनिकल रिसर्च इंस्टिट्यूट, लखनऊ द्वारा डॉ. गरिमा पाण्डेय के नेतृत्व में की गई यह शोध, महर्षि सुश्रुत द्वारा 30 शताब्दियों पहले अंकित उस योग का तर्क स्पष्ट करती है जिसमें घी में मूर्च्छित किया गया त्रिफला सर्वरोगहर कहा गया है।

3
त्रिफला और भोजन

आयुर्वेदिक पद्धति में ऐसे अनेक उदाहरण हैं जहां समान द्रव्य भोजन के साथ साथ रसायन तथा औषधि भी हैं। त्रिफला उनमें से एक है। आहार, रसायन और औषधि के मध्य ऐसी सुसंगत निरंतरता विश्व की किसी अन्य चिकित्सा पद्धति में नहीं पाई जाती। उदाहरण के लिये खजूर, शहद, गुड़, द्राक्षा, मुनक्का, बादाम, तिल, आँवला, बेल, लहसुन, सोंठ, कालीमिर्च, पिपली, हल्दी, केसर, जीरा, धनिया, मूंग, जल, दूध, घी, तुलसी, त्रिकटु एवं त्रिफला आदि ऐसे द्रव्य हैं जो भोजन, रसायन एवं औषधि तीनों ही तरह से प्रयुक्त होते आये हैं।

आयुर्वेद से तात्पर्य आयु के विज्ञान से है, और इसमें आहार, विहार, रसायन एवं औषधियों के अंतर्संबंधों की निरंतरता भी शामिल है। आयुर्वेद एक सम्पूर्ण जीवन पद्धति है, जिसमें चिकित्सा तो समाहित है ही, परन्तु उतना ही मूल्यवान वह प्रायोगिक और सैद्धांतिक ज्ञान है जो स्वस्थ व्यक्ति को जीवन भर स्वस्थ रखने में सक्षम है। केवल बीमार पड़ने पर ही आयुर्वेदाचार्यों के पास जाने के बज़ाय, स्वस्थ व्यक्ति को स्वस्थ बनाये रखने में उनकी भूमिका उतनी ही महत्वपूर्ण है। आहार, जीवन-शैली, रसायन और औषधियाँ हमें बीमारी में गिरने से बचाकर जीवन में खुशहाली बनाये रखने में मददगार हो सकती हैं।

यह एक सर्वमान्य तथ्य है कि युक्तिपूर्वक तय किये गये आहार व विहार अपने आप में औषधि एवं रसायन भी हैं। उदहारण के लिये, जब हमारा भोजन पथ्य-अपथ्य, हिताहार-अहिताहार, जठराग्नि की अनुकूलता, प्रकृति, विकृति, ऋतु, काल, स्थान और रस के पैमाने पर सघन परीक्षण के पश्चात शरीर में जाता है तो आहार, रसायन और औषधि के मध्य सैद्धांतिक अंतर की खाईं पट जाती है। प्रतीकात्मक भाषा में कहें तो हमारे जीवन व मृत्यु के मध्य आहार, विहार, रसायन व औषधियों की युक्तियुक्त समग्रता आयुर्वेद के चार एकीकृत रक्षा कवच हैं, जिनकी आज यहाँ चर्चा है।

आयुर्वेद के दो उद्देश्य हैं: स्वस्थ व्यक्ति के स्वास्थ्य की रक्षा और आतुर के विकार का प्रशमन।[1] यह समग्र दर्शन विश्व की किसी अन्य चिकित्सा-पद्धति नहीं पाया जाता। अन्यत्र केवल रोग का उपचार, न कि रोगी का सम्पूर्ण स्वास्थ्य, एकमात्र उद्देश्य होता है। यही कारण है कि आयुर्वेद की दृष्टि में स्वास्थ्य की परिभाषा विश्व में आज तक उपलब्ध अन्य सभी परिभाषाओं से अधिक विस्तृत, समग्र और परिपूर्ण है। इसके अनुसार जिस व्यक्ति के दोष, अग्नि, धातु, और मल-त्याग सन्तुलित हों, इन्द्रिय,

[1] **स्वस्थस्य स्वास्थ्यरक्षणम् आतुरस्य विकारप्रशमनम्। (च.सू. 30.26)**

आत्मा एवं मन प्रसन्न हो, वही स्वस्थ कहलाता है।[2] यहाँ शरीरिक, मानसिक एवं आध्यात्मिक या आत्मिक स्वास्थ्य को एक साथ साधा गया है। विश्व स्वास्थ्य संगठन द्वारा दी गयी परिभाषा आचार्य सुश्रुत की परिभाषा के थोड़ा समीप तो है पर अभी भी अपूर्ण है। इसके अनुसार, स्वास्थ्य न केवल रोग या दुर्बलता की अनुपस्थिति अपितु पूर्ण शारीरिक, मानसिक और सामाजिक खुशहाली की स्थिति है। वस्तुतः, स्वास्थ्य का जो आदर्श-मानदंड आयुर्वेद में निर्धारित है, उससे बेहतर मानदंड आज 3000 साल बाद भी विश्व में कोई नहीं दे पाया है। आयुर्वेद की समग्रता, वैज्ञानिकता, युक्ति-व्यपाश्रयता, वैयक्तिक-उन्मुखता एवं प्रकृति-अनुकूलता का यही राज है।

स्वस्थ व्यक्ति ऐसा क्या करे कि बीमार ही न हो? महर्षि चरक द्वारा निर्दिष्ट आहार, विहार, और आचार रसायन की युक्तियुक्त त्रिस्तरीय व्यूहरचना के माध्यम से शारीरिक, मानसिक और आत्मिक स्वास्थ्य सम्हालने का मूलमन्त्र[3] यह है कि हितकर भोजन व जीवन-शैली, समीक्षात्मक दृष्टिकोण युक्त, लोभ-लालच, मोह, ईर्ष्या, द्वेष आदि विषय-विकारों से मुक्त, उदार, समत्व-युक्त, सत्यनिष्ठ, क्षमावान, और महान लोगों के प्रति सेवाभावी व्यक्ति निरोगी रहता है। इसी प्रकार सुखदायी मति, सुखदायी वाणी, और सुखदायी कार्य वाला, सच्चाई-युक्त-अनुशासित, विशाल या निर्मल बुद्धि-युक्त, ज्ञान (वैज्ञानिक, अनुभवजन्य एवं पारंपरिक यथार्थ विचार), तप (शाश्वत मूल्यों की प्राप्ति हेतु आत्म-नियंत्रण) एवं योग (चित्त की वृत्तियों के निरोध द्वारा आत्मस्थ होने का अनुशासन) में तत्पर व्यक्ति भी रोगों में नहीं फंसता।

स्वास्थ्य-रक्षण और विकार-प्रशमन का साझा महत्व है, क्योंकि आरोग्य के बिना धर्म, अर्थ, काम और मोक्ष नहीं मिल सकता।[4] आयुर्वेद के मूल दर्शन में तो यह वाक्य खरे सोने की तरह सही है परंतु आज के भौतिकतावादी युग में यदि व्यक्ति स्वस्थ नहीं है या विकारों का प्रशमन नहीं हो पाये तो ना तो वह अपनी मूल प्रकृति के अनुसार कुछ धारण कर सकता है, ना ही धन कमा सकता है, ना ही जीवन में आहार, निद्रा व मैथुन का आनन्द ले सकता है, और ना ही शन्तिपूर्वक संसार से विदा हो सकता है। भौतिकतावादी युग में भी स्वास्थ्य से बढ़कर कुछ भी नहीं है।

आहार, निद्रा एवं ब्रह्मचर्य आयुर्वेद के तीन उपस्तंभ कहे गये हैं। इनका युक्तियुक्त प्रयोग दिनचर्या, रात्रिचर्या एवं ऋतुचर्या का महत्वपूर्ण अंग है जो स्वस्थ व्यक्ति के स्वास्थ्य की रक्षा में तो महत्वपूर्ण

---

[2] समदोषः समाग्निश्च समधातु मलक्रियः।
प्रसन्नात्मेन्द्रियमनाः स्वस्थइत्यभिधीयते।। (सु.सू., 15.41)

[3] नरो हिताहारविहारसेवी समीक्ष्यकारी विषयेष्वसक्तः।
दाता समः सत्यपरः क्षमावानाप्तोपसेवी च भवत्यरोगः।।
मतिर्वचः कर्म सुखानुबन्धं सत्त्वं विधेयं विशदा च बुद्धिः।
ज्ञानं तपस्तत्परता च योगे यस्यास्ति तं नानुपतन्ति रोगाः।। (च.शा., 2.46-47)

[4] धर्मार्थकाममोक्षाणामारोग्यं मूलमुत्तमम्। (च.सू. 1.15)

भूमिका निभाते ही हैं, इनका युक्तिपूर्वक प्रयोग रोगी के रोगों का शमन करने के लिये भी अपरिहार्य है। आहार की श्रेष्ठता, समग्रता एवं शुचिता स्वास्थ्यकर है। आहार की अपूर्णता, विषमता एवं अपवित्रता रोगकारक है। आयुर्वेद में संतुलित आहार से तात्पर्य उस भोजन से लिया जाता है जिसमें मधुर, अम्ल, लवण, कटु, तिक्त एवं कषाय नामक छः रस शामिल हों। यही कारण है कि युक्ति-व्यपाश्रय (प्रमाण-आधारित, तर्क-आधारित या यक्ति पर निर्भर) में औषधि व आहार की योजना मुख्य है। युक्तियुक्त आहार के बिना ना तो स्वस्थ व्यक्ति स्वस्थ रह सकता है और ना ही युक्तियुक्त पथ्य-अपथ्य का ध्यान रखे बिना आतुर के रोग का प्रशमन हो सकता।

स्वस्थ व्यक्ति के स्वास्थ्य की रक्षा और बीमारी को रोकने में भोजन का स्थान रसायन और औषधि से कम नहीं आँका जा सकता आहार से संतुष्टि, तत्क्षण शक्ति, और संबल मिलता है, तथा आयु, तेज, उत्साह, याददाश्त, ओज, एवं पाचन में वृद्धि होती है।[5] स्वाभाविक है कि साफ़-सुथरा, प्राकृतिक, और पौष्टिक भोजन शरीर, मन और आत्मा की प्रसन्नता और स्वास्थ्य के लिये आवश्यक है।

यहाँ भोजन से प्राप्त होने वाला ओज जीने के लिये बहुत महत्वपूर्ण है, जैसा कि आचार्य चरक ने लिखा है[6] कि ओजस के क्षय हो जाने से भय, दुर्बलता, चिंता, अकर्मण्यता, पीड़ा, निरुत्साह, निस्तेज इन्द्रियाँ, शरीर की चमक में फीकापन, मन में दुःख, चेहरे में शुष्कता, और दमदार आवाज में कमी आ जाती है। ओजस हृदय में पाया जाता है और ओजस का नाश होने से शरीर विनष्ट हो जाता है। तथाकथित-व्यंजनों के नाम पर बाज़ार में उपलब्ध कचरा-भोजन या जंक-फूड के भरोसे ओजस का सत्यानाश हो रहा है। साफ़ बात यह है कि यदि हम आयुर्वेद में दी गयी सलाह के अनुसार अपना भोजन लें तो ओजस को नष्ट होने और अंततः शरीर को नष्ट होने से बचा सकते हैं। इस दिशा में सात बातें महत्वपूर्ण हैं।

जहां भोजन का उद्देश्य मूल रूप से शरीर का समग्र पोषण करना है, वहीं रसायन का मूल उद्देश्य कोशिकाओं का पोषण एवं नवीनीकरण, रोग प्रतिरोधक क्षमता में वृद्धि, तथा जरा-व्याधि का नाश करते हुये दीर्घायु की प्राप्ति है। रोचक बात यह है कि आयुर्वेद में हितकारी आहार-विहार, पथ्य-अपथ्य, विरुद्ध आहार तथा पर्यावरण आदि को विशेष महत्व तो दिया ही गया है, साथ ही व्यक्ति-विशेष की प्रकृति के अनुरूप भी भोजन परिकल्पित किया गया है। वास्तव में भोजन और रसायन के मध्य अन्तर को बहुत स्पष्ट रूप से परिभाषित करना देश, काल, वातावरण और शरीर की प्रकृति और विकृति पर

---

[5] आहारः प्रीणनः सद्यो बलकृद्देहधारकः।
आयुस्तेजः समुत्साहस्मृत्योजोऽग्निविवर्द्धनः।। (सु.चि., 24.68)
[6] बिभेति दुर्बलोऽभीक्ष्णं ध्यायति व्यथितेन्द्रियः।
दुश्छायो दुर्मना रूक्षः क्षामश्चैवौजसः क्षये।।
हृदि तिष्ठति यच्छुद्धं रक्तमीषत्सपीतकम्।
ओजः शरीरे संख्यातं तन्नाशान्ना विनश्यति।। (च.सं., सू.स्था., 17.73-74)

निर्भर है। भोजन में जहां एक ओर छः रसों का होना आवश्यक है, वहीं रसायन में सभी रसों की बाध्यता नहीं है, परन्तु वीर्य को महत्त्व दिया गया है। रसायनों को मुख्य रूप से रेस्टोरेटिव और स्वास्थ्यकर न्यूट्रास्यूटीकल्स के रूप में भी समझा जा सकता है, जिनके प्रभाव से धातु, रस, अग्नि तथा स्रोत सब पर धनात्मक प्रभाव पड़ता है।

दुनिया अमरत्व के चक्कर में सदैव ही अमृत की खोज में लगी रही है। दुनिया भर के वैज्ञानिक रसायनों पर शोध में बड़ी रूचि लेते रहे हैं। आज इस शोध के दो निचोड़ महत्वपूर्ण हैं: पहला, गैर-संचारी रोगों जैसे हृदय रोग, कैन्सर, मधुमेह, मनोरोग, श्वसन-तंत्र आदि की रोकथाम में आहार और रसायन द्रव्यों की महत्वपूर्ण भूमिका पायी गयी है। रसायन औषधियां मूलतः शरीर के ऑक्सीडेटिव स्ट्रेस को कम करते हुये फ्री-रेडीकल स्केवेंजिंग तथा शरीर में पीड़ा या प्रदाह कम कर स्वास्थ्य की रक्षा करती हैं। दूसरा, आधुनिक विज्ञान की शोध से यह भी स्पष्ट हुआ है कि रसायन मुख्य रूप से एडॉप्टोजेन एवं इम्यूनोमोड्यूलेटर का कार्य करते हैं। वात, पित्त और कफ की विषमता को शान्त करने में भी इनकी भूमिका है। रसायन के प्रभाव की प्रक्रिया मुख्य रूप से फ्री-रेडीकल स्केवेंजिंग तो है ही, इसके साथ ही एंटी-ऑक्सीडेंट एंजाजाइम्स को बढ़ावा देना, लिपिड पेरोक्सीडेशन को रोकना, पीड़ाशामक, स्नायु-तंत्र का कायाकल्प आदि हैं।

आहार में आहार विधि, मात्रा, समय, संयोग, भोजन बनाने की क्रिया, भोजन प्राप्ति करने के स्थान, आहार के घटक, दोष, सेवन विधि, विरुद्धाहार जैसी अनेक बातें महत्वपूर्ण हैं। आहार युक्तिपूर्वक किया जाए तो मन प्राण और शरीर का पोषण होता है। अयुक्तिपूर्वक सेवन किया जाये तो आहार विष हो जाता है। आहार का यह सुरक्षा कवच आज सबसे कमजोर स्थिति में है।

विहार में वस्तुतः संपूर्ण स्वास्थ्यवृत्त जैसे ऋतुचर्या, दिनचर्या, रात्रिचर्या आदि शामिल हैं। आज की स्थिति में देखा जाय तो एक ओर सुन्दर और साफ दिखने की होड़ तो मची हुई है, परन्तु व्यायाम, योग, ध्यान, आचार रसायन आदि को बहुत उपेक्षित किया जा रहा है। आहार एवं विहार दोनों ही रक्षा कवचों के कमजोर होने से सारा दारोमदार रसायन और औषधि पर आ जाता है। यह मानव स्वास्थ्य के लिये शुभ लक्षण नहीं है।

आयुर्वेद की दृष्टि में जरा-व्याधि का नाश करने वाले, स्वास्थ्यकर व ओजस्कर द्रव्य को रसायन जानना चाहिये।[7] आज की शब्दावली शब्दों में कहें तो उम्र के साथ बढ़ने वाले रोगों की उत्पत्ति फ्री-रेडिकल्स की बहुलता से ऑक्सीडेटिव स्ट्रेस बढ़ने और इनफ्लेमेशन के कारण होती है। यदि आहार, विहार,

---

[7] **रसायनं च तज्ज्ञेयं यज्जराव्याधिनाशनम्।**
ज्ञेयं रसायनं तच्च स्वस्थस्योर्जस्करं च यत्।।

रसायन और औषधियों की युक्तियुक्त व्यवस्था से ऑक्सीडेटिव स्ट्रेस और इनफ्लेमेशन (दर्द या सूज़न) को नियंत्रित कर लिया जाये तो उम्र के आधार पर लगने वाली बीमारियों से बचा जा सकता है।

आयु-आधारित व्याधिजनन या एज-रिलेटेड-पैथोजेनेसिस समकालीन विश्व की सबसे गंभीर समस्या है जिससे बायो-मेडिकल साइंस अभी तक पार नहीं पा सका है। रसायन प्रभावी रूप से इम्यूनोमोडुलेशन तो करते ही हैं, ऑक्सीडेटिव स्ट्रेस और इनफ्लेमेशन के निरापद चिकित्सकीय प्रबंध के लिये आयुर्वेद की रसायन चिकित्सा से बेहतर कोई और चिकित्सा पद्धति विश्व में ज्ञात नहीं है। रसायनों के सन्दर्भ में आचार्य चरक ने कहा है कि[8] रसायन दीर्घ-आयु, स्मरण-शक्ति, मेधा, आरोग्य, तरुणाई, चमकदार शरीर, मोहक रंग, उदार-स्वर, शरीर और इन्द्रिय में परम बल, विलक्षण वाणी, शिष्टाचार, कान्ति आदि प्राप्त करने का उपाय है। सौन्दर्य विज्ञान की भाषा में कहें तो मन, प्राण और शरीर के स्वास्थ्य और सौन्दर्य का निखार स्थायी होने लगता है।

इस संपूर्ण चर्चा का सार यह है कि रोगी होने से बचना है तो आहार, विहार एवं रसायन के सुरक्षा-कवच को टूटने से बचाना होगा। और इसमें त्रिफला की महत्वपूर्ण भूमिका है। बीमार पड़ने पर विवशता में वैद्यों-डॉक्टरों के पास तो भागना ही पड़ता है। जीवन का असल आनंद तो तब आयेगा जब सदैव स्वस्थ बने रहने के लिये आयुर्वेदाचार्यों की निरंतर सलाह लेते हुये उस पर अमल किया जाये। आयुर्वेदाचार्यों की प्रमाण-आधारित सलाह आहार, विहार, व रसायनों के युक्तियुक्त संयोजन हेतु अपरिहार्य है।

---

[8] **दीर्घमायुः स्मृतिं मेधामारोग्यं तरुणं वयः।**
प्रभावर्णस्वरौदार्यं देहेन्द्रियबलं परम्।।
वाक्सिद्धिं प्रणतिं कान्तिं लभते ना रसायनात्।
लाभोपायो हि शस्तानां रसादीनां रसायनम्।। (च.चि.,1.7-8)

4
त्रिफला और चिकित्सकीय परामर्श

सेल्फ-मेडिकेशन एक वैश्विक समस्या है, जो तब और विकट हो जाती है जब बात त्रिफला को औषधि के रूप में लेने की हो। सबसे अधिक आश्चर्य मुझे तब हुआ जब दो वर्ष पहले मेरा नाती यजुर्विद, जो तब बोलना सीख ही रहा था, बीमार हुआ। उसका कहना था कि डॉक्टर के पास नहीं जायेगा, 'आपी-आपी' दवाई खायेगा। बात जब आयुर्वेदिक औषधियों की हो तो हर आदमी आज यजुर्विद के 'आपी-आपी' सिद्धांत पर चल पड़ा है। आज हर व्यक्ति आयुर्वेद का विशेषज्ञ बना हुआ दिखाई पड़ता है। अनेक लोगों को भ्रम है कि आयुर्वेद की औषधियाँ पूर्णतः दुष्प्रभाव-रहित होती हैं। राजस्थान के प्रसिद्ध आयुर्वेदाचार्य डॉ. अनुराग दुबे का कहना है कि इसका तात्पर्य तो यह होगा कि यदि कोई दुष्प्रभाव नहीं है तो फिर कोई सद्प्रभाव कैसे हो सकता है। वास्तविकता तो यह है कि जिस प्रकार से आयुर्वेद की औषधियाँ रोगी व्यक्ति के रोग का शमन करने या स्वस्थ्य व्यक्ति के स्वास्थ्य की रक्षा करने में प्रभावी हैं, त्रुटिपूर्ण तरीके से लिये जाने पर उतनी ही दुष्प्रभावी भी हो सकती हैं। यदि कुछ प्रकरणों में दुष्प्रभाव परिलक्षित नहीं भी हो तो उन प्रकरणों में आहार, विहार, रसायन, पथ्य-अपथ्य के सुसंगत उपयोग की जानकारी व क्रियान्वयन न होने से औषधियों के वांछित प्रभाव भी नहीं मिलते। त्रिफला भी इसका अपवाद नहीं है।

आयुर्वेद में शुण्ठी, कृष्ण-मरिच और पिप्पली को मिलाकर त्रिकटु नामक योग का वर्णन सभी आयुर्वेदिक गन्थों में मिलता है। आधुनिक वैज्ञानिकों द्वारा लम्बे समय तक यह माना जाता रहा कि काली-मिर्च और पिप्पली में से कोई एक द्रव्य मिला देने से भी तैयार योग वही कार्य करेगा जो काली-मिर्च और पिप्पली मिलाने से करता है। तर्क यह था कि दोनों ही प्रजातियों में पाइपेरीन मूल घटक है। किन्तु त्रिकटु की कल्पना के लगभग 3000 साल बाद, 14 जुलाई, 2011 को विश्व की सर्वाधिक प्रतिष्ठित शोधपत्रिका नेचर में छपी एक शोध ने वैज्ञानिक जगत को आश्चर्यचकित कर दिया। यह पिप्पली में पाये जाने वाले पाइपरलोंग्युमाइन नामक पदार्थ की खोज थी, जो कैंसर-कोशिकाओं को चुनचुनकर मारता है। और इस खोज के साथ यह भी सिद्ध हो गया कि भले ही काली-मिर्च और पिप्पली दोनों में पाइपेरीन प्रचुरता से पाया जाता हो, त्रिकटु में ये दोनों प्रजातियाँ पारस्परिक विकल्प नहीं हैं।

इस उदाहरण से यह स्पष्ट होता है कि आयुर्वेद के त्रिफला या त्रिकटु जैसे बहु-औषधि-प्रजातीय या पॉलीहर्बल योग के विविध घटक वास्तव में साझा तालमेल के साथ मानव शरीर के पूर्ण स्वास्थ्य में सुधार की दिशा में कार्य करते हैं। विविध रस, गुण, वीर्य, विपाक व प्रभाव वाले द्रव्यों के शास्त्रीय सिद्धांतों के अनुरूप मिश्रण से उनकी परस्पर उपयोगिता बढ़ जाती है। परन्तु किस रस, गुण, वीर्य,

विपाक व प्रभाव वाले औषधीय द्रव्य के साथ किसका योग, किस रोग के शमन के लिये किया जा सकता है, यह समझना केवल उन्ही आयुर्वेदाचार्यों के बस की बात है जो उभयज्ञ हों, अर्थात शास्त्रज्ञ और कर्मज्ञ दोनों ही हों। अनुभवी और प्रख्यात आयुर्वेदाचार्य डॉ. हरि ओम शर्मा का मानना है कि आयुर्वेद के मूलभूत सिद्धान्तों के प्रकाश में रोगी के लिये रसायन प्रयोग और औषधि निर्धारण किया जाता है। रोग, रोगी और रोग निदान के साथ व्याधिविनिश्चय के उपरान्त ही औषधि का प्रयोग व्यावहारिक है। चिकित्सक अपनी चिकित्सा पद्धति के सिद्धान्तों व युक्ति के साथ स्वयं के अनुभवजन्य ज्ञान को भी रोग निदानादि व औषधि प्रयोग निर्धारण में माला की तरह पिरोता है, तभी रोग का शमन होता है। आजकल एक ऐसी गूगलज्ञानी भीड़ पैदा हो गयी है जो स्वयं को ज्ञान-सम्पन्न समझने का मिथ्या भ्रम तो पालती ही है, वह चिकित्सक को भी अपने गूगलज्ञान की तराजू में तौलती नजर आती है। ये लोग संभवतः यह नहीं समझ पा रहे हैं कि विष और हथियार एक जैसे हैं। सही प्रयोग से विष भी अमृत हो जाता है और गलत प्रयोग से अमृत भी विष के समान घातक और जानलेवा हो जाता है।[1] च्यवनप्राश अवलेह रसायन इस बात का सबसे बढ़िया उदाहरण है। यह अवलेह मूलतः कुटी-प्रावेशिक रसायन है। लेकिन बाज़ारवाद, अल्पज्ञान व मनमाने प्रयोग ने इस रसायन को वातातपिक रसायन से भी गया-बीता बना दिया।

जिन लोगों को यह भ्रम है कि आयुर्वेद मात्र त्रिफला का चूरन फाँकने, घनवटी खाने या जूस पीने का विज्ञान है, उनको यह बता देना उपयोगी रहेगा कि 5000 वर्ष के इतिहास में आज तक प्राप्त हुई लाखों पांडुलिपियों में समाहित ज्ञान, और आयुर्वेद पर लिखे गये 8000 से अधिक शोधपत्र, और आयुर्वेद में प्रयुक्त होने वाले औषधीय पौधों पर लिखे गये 80,000 से अधिक शोधपत्र, यही सिद्ध करते हैं कि विश्व में इससे प्राचीन, विस्तृत, प्रभावी और आज भी यथावत उपयोगी अन्य चिकित्सा पद्धति अभी तक तो नहीं खोजी जा सकी है। अध्ययनों की एक लंबी सूची वैज्ञानिक शोधकर्ताओं ने दी है जिनमे आयुर्वेदिक एवं एलोपेथिक औषधियाँ साथ में लेने पर एक दूसरे को निष्प्रभावी करने लगती हैं, या दुष्परिणाम देती हैं। लोग किसी भी रोग को विरुद्ध आयुर्वेद की गोलियाँ, चूर्ण, आसव या अरिष्ट बाजार से खरीद कर सीधे ग्रहण करने लगते हैं और अपनी दिनचर्या में किसी बदलाव की चिन्ता नहीं करते। वस्तुतः आयुर्वेद केवल गिलोय घनवटी खाने या एलो वेरा का जूस पीने का विज्ञान नहीं है। प्रत्येक आयुर्वेदिक औषधि के साथ सहपान, अनुपान, पथ्य-अपथ्य एवं स्वास्थ्य व्रत का पालन करना अनिवार्य होता है। इनके बिना आयुर्वेदिक औषधि लाभकारी नहीं होती। लोगों के बीच भ्रम के

---

[1] **यथा विषं यथा शस्त्रं यथाऽग्निरशनिर्यथा।**
तथौषधमविज्ञातं विज्ञातममृतं यथा।।
औषधं ह्यनभिज्ञातं नामरूपगुणैस्त्रिभिः।
विज्ञातं चापि दुर्युक्तमनर्थायोपपद्यते।।
योगादपि विषं तीक्ष्णमुत्तमं भेषजं भवेत्।
भेषजं चापि दुर्युक्तं तीक्ष्णं संपद्यते विषम्।। **(च.सं. सूत्रस्थान, 1.124-126)**

कारण रसायन औषधियों के निर्माता आज चांदी कूट रहे हैं। गरम रोटी की तरह दनादन बिकने वाले च्यवनप्राश, ब्रह्म रसायन, आमलकी रसायन, त्रिफला आदि से आज बाज़ार भाठ दिया गया है। ऐसी दशा में ध्यान देने वाली बात यह है कि आयुर्वेदिक पद्धति से शरीर का समुचित शोधन किये बिना किसी रसायन को ग्रहण करने का कोई विशेष लाभ नहीं है। आचार्य वाग्भट ने 1500 वर्ष पहले इस पर रोचक कटाक्ष मारा है कि पुराने कपड़े को बिना साफ किये रंग चढ़ाने का कोई मज़ा नहीं है।[2]

यदि त्रिफला जैसी महत्वपूर्ण औषधि का उदाहरण लें तो आयुर्वेदाचार्य आपके वात, पित्त और कफ से संबंधित विविध बीमारियों के लिये त्रिफला को लेने के लिये कह सकते हैं। लेकिन इसका तात्पर्य यह नहीं हुआ कि हम बिना आयुर्वेदाचार्य के विस्तृत परीक्षण व सलाह के ही त्रिफला को अपने हिसाब से विविध बीमारियों को ठीक करने के लिये अपने आप लेने लगे। आयुर्वेदाचार्य रोगी का परीक्षण कर पहले रोग का निदान करते हैं, उसके पश्चात औषधि तय करते हैं। यदि त्रिफला उनमें से एक औषधि हुई तो अलग अलग सहपान और अनुपान के साथ ही त्रिफला ग्रहण करना उपयोगी रहेगा। उदाहरण के लिये, कफज रोगों में त्रिफला शहद के साथ, पित्तज रोगों में त्रिफला घी के साथ तथा वातज रोगों में त्रिफला सेंधा नमक के साथ लिया जाता है। इसके अतिरिक्त रोगी की प्रकृति परीक्षा, पंचविधि निदान, अष्टविधि परीक्षा, दसविधि परीक्षा, मूत्र व मल परीक्षण और नाड़ी परीक्षण भी किया जाता है। तदानुसार त्रिफला के साथ लिया जाने वाला सहपान भिन्न-भिन्न है। उदर की अम्लीयता को सुधारने के लिये त्रिफला को मिश्री के साथ, कब्ज या बिबन्ध में त्रिफला को गर्म जल के साथ, पेप्टिक अल्सर में तेल या घी के साथ, नेत्र रोगों में शहद एवं घी के साथ, मुख रोग में केवल त्रिफला चूर्ण तथा यकृत की बीमारियों में त्रिफला क्वाथ का उपयोग किया जाता है। दुष्टव्रण या न भरने वाले घावों के लिये त्रिफला का बाह्य प्रयोग भी किया जाता है। कुल मिलाकर कहने का तात्पर्य यह है कि ली जाने वाली औषधि किस सहपान या अनुपान के साथ ली जाये, यह जानना व तदानुसार प्रयोग करना आयुर्वेदिक औषधि के प्रभावी होने के लिये एक महत्वपूर्ण शर्त है।

त्रिफला का दूसरा उदाहरण चिकिनगुनिया रोग के सन्दर्भ में है। इस रोग की एलोपेथी में कोई ठोस औषधि नहीं है, जबकि आयुर्वेद के युक्त-व्यपाश्रय के सिद्धांत से सफलतापूर्वक उपचारित किया जाता है। जैसा कि ऋषिकेश स्थित देश के प्रख्यात आयुर्वेदाचार्य डॉ. हर्ष सहगल का मत है, बीमारी की प्रारम्भिक अवस्था से लेकर रोगमुक्त होने तक कफ, पित्त, और वात की स्थिति में क्रमशः बदलाव आता है। अतः चिकनगुनिया के उपचार में त्रिफला सहित अन्य औषधियों की मात्रा, प्रकार, सहपान-अनुपान तथा पथ्य-अपथ्य प्रतिदिन पुनर्व्यवस्थित करना पड़ता है। इस चिकित्सकीय पचड़े को समझना और क्रियान्वित करना किसी उभयज्ञ, अर्थात शास्त्रज्ञ व कर्मज्ञ, आयुर्वेदाचार्य के बस की ही बात है।

---

[2] **अविशुद्धे शरीरे हि युक्तो रासायनो विधिः।**
वाजीकरो वा मलिने वस्त्रे रङ्ग इवाफलः।। (अष्टांगहृदय, उत्तरस्थान, 39.4)

अंततः, हमारे लिये सबसे उपयोगी बात यह है कि प्रशिक्षित आयुर्वेदाचार्यों की सलाह से ही रसायनों और औषधियों का उपयोग किया जाना लाभकारी और सुरक्षित रहता है। आयुर्वेदाचार्य वास्तव में व्यक्ति-व्यक्ति को देख कर बीमारी, औषधि और क्रियाकाल को समग्र रूप से समझते हुये चिकित्सा निर्धारित करते हैं। स्वाभाविक है कि चिकित्सकों का उत्तरदायित्व है कि वे लोगों के उस विश्वास पर खरे उतरें जिसके कारण समाज उन्हें भगवान का दर्ज़ा देता आया है। उन्हें आचार्य सुश्रुत की सलाह याद रखना होगा कि आयुर्वेदाचार्य वही उत्तम है जो चिकित्सा शास्त्रों एवं चिकित्सा कर्म दोनों का अच्छा ज्ञान रखता है। शास्त्रज्ञ और कर्मज्ञ को ही उभयज्ञ आयवुर्वेदाचार्य कहा जाता है। दोनों में किसी एक को न जानने पर वह एक पहिये वाली गाड़ी या एक पंख वाली चिड़िया की तरह होता है जो कहीं भी लड़खड़ा जायेगा। आने वाला समय उन आयुर्वेदाचार्यों का होगा जो समस्त आयुर्वेदिक संहिताओं, समकालीन वैज्ञानिक शोध और स्वयं की चिकित्सकीय दक्षता को निरंतर एकीकृत और आत्मसात करते हुये स्वस्थ्य व्यक्ति के स्वास्थ्य की रक्षा और रोगी को रोगमुक्त करेंगे।

5
आयुर्वेदाचार्यों के अनुभव की साझेदारी

आयुर्वेदाचार्य आयुर्वेदिक चिकित्सा के मूल आधार हैं। उनका कार्य मानवता की सेवा के लिये समर्पण का एक उत्कृष्ट उदहारण है। जब कोई व्यक्ति किसी आयुर्वेदाचार्य के पास चिकित्सा हेतु जाता है, तो यह एक साधारण विश्वास नहीं बल्कि जीवन की संभावनाओं और मृत्यु की आशंकाओं के संधिकाल की अवस्था में प्रकट किया गया विश्वास है। यही कारण है कि आयुर्वेदाचार्यों को चरकसंहिता में दी गयी सलाह वैश्विक कल्याण का गहन दर्शन है। यों तो समय समय पर भगवान धन्वंतरि, अश्विनीकुमार, काशिराज दिवोदास, पुनर्वसु आत्रेय, अग्निवेश, भेल, पाराशर, हारीत, क्षारपाणि, च्यवन, चरक, सुश्रुत, वाग्भट, भावमिश्र, नागार्जुन, चक्रदत्त, सारंगधर जैसे धुरंधर प्राचीन आयुर्वेदाचार्यों ने संहिताओं के माध्यम से आने वाली पीढ़ियों के साथ ज्ञान की साझेदारी किया। तथापि, उस ज्ञान का कुछ अंश ही अब संहिताओं के रूप में उपलब्ध है।

आयुर्वेद की कठोर आलोचना इस बात के लिये होती रही है कि आयुर्वेदिक औषधियों में क्लीनिकल ट्रायल बहुत कम हुये हैं। शोधकर्ताओं का मत रहा है कि मजबूत रैंडमाइज्ड क्लिनिकल ट्रायल्स के बिना यह निश्चित रूप से कह पाना संभव नहीं है कि आयुर्वेदिक औषधियाँ प्रभावी हैं।

लेकिन इस विषय पर मतैक्य नहीं है। आयुर्वेदाचार्यों द्वारा यह तर्क दिया जाता है कि प्राचीन ग्रन्थों में वर्णित औषधियां वस्तुतः आचार्यों के उस गहन प्रेक्षण का परिणाम हैं जिन्हें आधुनिक युग में क्लीनिकल ट्रायल कहा जाता है। इस तर्क के पक्ष में आधुनिक वैज्ञानिक शोध का ही सहारा लेते हुये कहा जाता है कि आयुर्वेदिक औषधियों पर आज तक जो भी शोध हुई है, उसके परिणाम आचार्यों द्वारा इंगित परिणामों से भिन्न नहीं मिले हैं। समकालीन आयुर्वेदाचार्यों द्वारा उन व्याधियों के अनेक रोगियों को स्वस्थ किया गया है जिन पर प्राचीन ग्रन्थों में जानकारी है। जिन प्रकरणों में रोग ठीक नहीं होता उसका मुख्य कारण प्रायः यह रहता है कि आचार्यों द्वारा बताये गये आहार-विहार, रसायन, ऋतुचर्या, दिनचर्या, पथ्य-अपथ्य, पंचकर्म आदि को लोगों द्वारा अनुशासित प्रयोग नहीं किया जाता जिस प्रकार प्राचीन ग्रन्थों में निर्देशित है।

दूसरी ओर प्रतिस्पर्धी समूह का यह मानना है कि आधुनिक विज्ञान का उपयोग करते हुये रेन्डमाइज्ड, डबल-ब्लाइंड, प्लेसिबो-नियंत्रित, बहु-केन्द्रीय, क्रॉसओवर, क्लीनिकल ट्रायल (आर.सी.टी.) औषधि की प्रभाविता को परखने के लिये अनिवार्य हैं। इस विचार के विरुद्ध आयुर्वेदाचार्यों के तर्क हैं। आयुर्वेद में पर्सनलाइज्ड मेडिसिन या वैयक्तिक औषधि का मुख्य योगदान है। व्यक्ति-व्यक्ति के परीक्षण, प्रकृति,

विकृति, आयु, सार, सात्म्य, सत्व, आहारशक्ति, व्यायामशक्ति एवं बल के अनुसार ही औषधि दी जा सकती है। औषधि देने के पूर्व रोगी के इन तमाम व्यक्तिगत लक्षणों के साथ ही औषधि के कारकों, जैसे औषधि की प्रकृति, गुण, प्रभाव, देश, ऋतु, गृहित, निहित, संस्कार, मात्रा, संयोग, एवं अधिष्ठान आदि का ध्यान रखा जाता है। इसके साथ ही, व्यक्तिगत स्तर पर आहार-विहार, ऋतुचर्या, दिनचर्या, रात्रिचर्या आदि की व्यवस्था है। अतः आधुनिक विज्ञान द्वारा क्लीनिकल ट्रायल की जो कथित वैज्ञानिक पद्धति अभी प्रयोग की जा रही है उसके द्वारा अयुर्वेदिक औषधियों के संदर्भ में ठोस और निर्विवाद वैज्ञानिक निष्कर्ष नहीं निकाले जा सकते हैं। इसके लिये बहुत परिष्कृत शोध विधियों या मेथड्स की आवश्यकता है जो अभी आधुनिक विज्ञान में विकसित नहीं हो पाई हैं।

आधुनिक विज्ञान के शोधकर्ताओं द्वारा एक तर्क यह भी दिया जाता है कि आयुर्वेद की औषधियों में रोग ठीक करने वाला मोलिक्यूल और शरीर में उसकी प्रकिया या मैकेनिज्म ज्ञात नहीं है। मेकेनिनज़्म ऑफ एक्शन या मोलीक्यूल के संदर्भ में आयुर्वेदाचार्यों द्वारा यह तर्क दिया जाता है कि आयुर्वेदिक औषधियां मूल रूप से बहु-पादपीय मिश्रण हैं, तथा उनमें समाहित अनेक उपयोगी औषधीय तत्व मिल-जुल कर एक ही दिशा में कार्य करते हुये न केवल रोग ठीक करते हैं, अपितु व्यक्ति को पूर्ण स्वास्थ्य प्रदान करते हैं।

दोनों पक्षों के वैज्ञानिक तर्कों को समाहित किये बिना उनका समाधान हो भी नहीं पायेगा। तथापि, क्लीनिकल ट्रायल की चुनौती पर शोध का एक नया रास्ता दृष्टिगत है। देश में आयुर्वेदाचार्यों की संख्या लगभग 4 लाख है। इन आयुर्वेदाचार्यों द्वारा विभिन्न रोगों के शमन एवं व्यक्ति को स्वस्थ करने हेतु निदान, चिकित्सा और आहार-विहार आदि के विभिन्न परिणाम प्राप्त होते हैं। यदि इस ज्ञान को निरंतर एक डेटाबेस में संकलित करते हुये विश्लेषण किया जाये तो प्रकरण-आधारित, रोग-आधारित, व्यक्ति-आधारित एवं स्थान आधारित, और अंततः पूर्ण वैज्ञानिक जानकारी प्राप्त की जा सकती है। वर्तमान में एलोपैथी में किये जा रहे अधिकाँश क्लिनिकल ट्रायल्स की विधि ही अंतिम सत्य नहीं है। वस्तुतः क्लिनिकल ट्रायल्स को बेहतर, तर्कसंगत और समाजोपयोगी बनाने की भारी आवश्यकता है।

भारत में आयुर्वेद के क्षेत्र में वैज्ञानिक शोध और शिक्षा में लगे हुये अग्रणी विद्वानों, प्रोफेसर भूषण पटवर्धन, प्रोफेसर माधव बघेल, प्रोफेसर राजेश कोटेचा, डॉ. दर्शन शंकर आदि द्वारा ठोस तर्क दिये गये हैं कि आयुर्वेद को आर.सी.टी. से मुक्त कर, क्लिनिकल ट्रायल्स की बेहतर वैज्ञानिक विधि विकसित करना आवश्यक है। आयुर्वेद में माना जाता है कि प्रत्येक व्यक्ति की प्रकृति अनोखी तथा भिन्न है, और तदानुसार वैयक्तिक एवं संपूर्ण चिकित्सा प्रदान की जाती है। तथाकथित आधुनिक क्लिनिकल ट्रायल्स के नाम पर आयुर्वेद के बुनियादी सिद्धांतों एवं अनुभवजन्य साक्ष्य को तिलांजलि नहीं दी सकती। सुरक्षा और गुणवत्ता से समझौता न करते हुये, केवल बीमारी ठीक करने के रिडक्शनिस्ट एप्रोच के बजाय आयुर्वेद के समग्र-प्रणाली या होल-सिस्टम एप्रोच को अक्षुण्ण रखने की

आवश्यकता है। अनेक शोधकर्ताओं ने इस विधि की उपयोगिता सिद्ध करते हुये वैश्विक-स्तर के शोधपत्र प्रकाशित किये हैं।

आयुर्वेदाचार्यों के स्तर पर भी सोशल मीडिया के माध्यम से आपस में अनुभवों के आदान-प्रदान की दुरुस्त व्यवस्थायें खड़ी की जा रही हैं। उदाहरण के लिये, राजस्थान के पश्चिमी रेगिस्तानी क्षेत्र में कार्यरत प्रख्यात वैद्य हेतराम सुथार के नेतृत्व में 4300 से अधिक सदस्यों का 'सिम्पली आयुर्वेदा' नामक एक फेसबुक ग्रुप खड़ा किया गया है। इसमें देश के विभिन्न राज्यों के आयुर्वेदाचार्य और रोगी दोनों ही तरह के सदस्य हैं। कुछ विशेष आमंत्रित स्वतंत्र प्रेक्षक भी सदस्य हैं। यहाँ आप अपनी समस्या, क्लिनिकल परीक्षण के दस्तावेज आदि प्रस्तुत करते हैं। इसके बाद आयुर्वेदाचार्य अनेक प्रश्नों के माध्यम से बहुविधि परीक्षण कर निष्कर्ष पर पहुँचते और अंकित करते हैं। दूर-दराज में स्थित सदस्यों को व्यक्तिगत परीक्षण हेतु भी जरूरत पर आग्रह करते हैं। आयुर्वेदाचार्य अपने अनुभवजन्य ज्ञान और कौशल के आधार पर औषधि, आहार-विहार, दिनचर्या, ऋतुचर्या, पथ्य-अपथ्य आदि का निर्धारण कर सुझाव देते हैं। इन सुझावों पर तर्कसंगत चर्चा होती है और तब अंततोगत्वा रोगी को प्रमाण-आधारित सुझाव प्राप्त होता है। इस प्रकार के प्रयत्नों के माध्यम से जानकारी के संकलन एवं विश्लेषण को आगे और भी व्यवस्थित करने की आवश्यकता है, पर यह एक अत्यंत महत्वपूर्ण शुरुआत है।

आपसी विचार-विमर्श व्यवस्थित शोध नहीं है, परन्तु आयुर्वेदाचार्य यदि अपना डेटाबेस संधारित करते हैं तो प्रत्येक रोगी का प्रकरण अपने आप में एक सैम्पल के रूप में देखा जा सकता है। विश्लेषण को सभी रोगियों की प्रकृति जैसे वात्, पित्त और कफ की स्थिति, अनेक कारणों में से विशिष्ट कारण आयु, व्याधि-क्षमत्व, आहार-विहार आदि के अधार पर प्रत्येक प्रकरण को वर्गीकृत करते हुये विश्लेषण किया जा सकता है। सर्वाधिक प्रभावी पाई गई औषधि की जानकारी सभी आयुर्वेदाचार्यों के साथ साझा की जा सकती है। इस पदानुक्रमिक विश्लेषण के आधार पर आयुर्वेद की विशिष्ट सैद्धान्तिक वैयक्तिक-उन्मुखता के साथ समझौता किये बिना प्रमाण-आधारित औषधि निर्धारित की जा सकती है। अभी इस प्रकार की विधिवत व्यवस्था देश में नहीं है।

संकलित आंकड़ों का आधुनिक सांख्यिकीय विधि से विश्लेषण करते हुये विश्व की उत्कृष्ट शोध पत्रिकाओं में प्रकाशित किया जा सकता है। देश के 4 लाख आयुर्वेदाचार्यों के ज्ञान और कौशल से तैयार होने वाला यह विश्व का अद्वितीय डेटाबेस हो सकता है। समकालीन आयुर्वेदाचार्यों यदि त्रिफला तथा ऐसी ही बहु-प्रयोज्य आयुर्वेदिक औषधियों पर अपना अनुभवजन्य ज्ञान साझा करें तो आयुर्वेद चिकित्सा पद्धति को एक बार पुनः शिखर पर ले जा सकता है।

एक बात उन आयुर्वेदाचार्यों से कहना है जो अपना ज्ञान गोपनीय रखना चाहते हैं। यदि हमने अपना ज्ञान छुपाकर रखा तो एक दिन हमारे साथ हमारा ज्ञान भी चला जायेगा। सोचिये, क्या आज हम

आयुर्वेदाचार्य कहलाने लायक रहते यदि भगवान धन्वंतरि, अश्विनीकुमार, काशिराज दिवोदास, पुनर्वसु आत्रेय, अग्निवेश, भेल, पाराशर, हारीत, क्षारपाणि, च्यवन, चरक, सुश्रुत, वाग्भट, भावमिश्र, नागार्जुन, चक्रदत्त, सारंगधर जैसे धुरंधर आयुर्वेदाचार्यों ने अपना ज्ञान छुपाया होता। आगे आइये। ज्ञान की साझेदारी कीजिये। आपका ज्ञान आपके बाद भी वैश्विक मानवता के कल्याणार्थ जीवित रहेगा।

6
Clinical studies on *Triphala* and its constituents

1. Adhikari, A., S. Biswas, R. Raman De, A. Mitra, J. Hazra and P. K. Debnath (2013). "**Role of Imunomet in upper respiratory tract disorders: A randomized double blind placebo controlled clinical trial.**" Indian Journal of Traditional Knowledge **12**(2): 281-283.

Upper respiratory tract disorders comprise 87.5% of total acute respiratory morbidity in children in India. This has become a major community health problem. The symptoms are often self limiting and many a time caused by viruses, however, recurrent attacks may lead to distinct morbidity. This study was conducted in hospital outpatient department on children who have been attending at frequent interval with complaints of sore throat, pharyngitis, tonsillitis. They were administered Imunomet syrup or tablet (a multiherbal formulation contains *Asparagus racemosus*, ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***), *Glycyrrhiza glabra*) for a period of 8 weeks. At the end of the treatment, about 84% patients responded well to treatment and 16% patients had fair response to treatment. None of the patients showed any adverse reaction to treatment. The syrup was found to be palatable.

2. Amitabha, M., K. Samagandi and S. K. Kumar (2013). "**A pilot study to evaluate the efficacy of triphala madhu sarpi in computer vision syndrome**." International Journal of Research in Ayurveda and Pharmacy **4**(6): 800-804.

Computer vision syndrome is an endemic disease of 21st century and an evil consequence of use of computers in improper manner. Being a disease of modern era, it is difficult to get the nearest resembling disease in Ayurveda excellence. Ayurveda being the science of life, everything including ideal life style has been mentioned in it in the form of Dinachairya, Ritucharіya, Ratrichariya etc. Computer vision syndrome (CVS) is a disease related to modus Vivendi and it is expected that relief can be obtained by following Dinacharya etc. Present study was planned with an aim and objectives, to compile and commemorate the references of computer vision syndrome and its related diseases in Ayurveda excellence, postulate the Samprapti Ghataka (Patho -physiology) of computer vision syndrome according to Ayurveda, hypothetically and rule out the effect of ***Triphala*** Madhu Sarpi in reliving the sign and symptoms of computer vision syndrome. Materials and methods of this pilot study were planned on 10 samples of CVS. Samples were administered with Triphala Madhu Sarpi in a dose of 3 g of Triphala powder along 5 ml of Madhu and 5 ml of Ghrita (Made from Dadhi of pure cow's milk) at night before meal. Effect of intervention was assessed once in 15 days interval. Results of the study revealed that Triphala Madhu Sarpi showed above 75 % relief for most of the subjective criteria's and objective criteria's like dry eye (by schirmer test), and p value were < 0.001 for itching and burning sensation of eye, fatigue and eye strain like conditions i.e. highly significant result after 2 month of therapy.

3. Awasthi, H., R. Nath, K. Usman, D. Mani, S. Khattri, A. Nischal, M. Singh and K. K. Sawlani (2015). "**Effects of a standardized Ayurvedic formulation on diabetes control in newly diagnosed Type-2 diabetics; a randomized active controlled clinical study**." Complementary Therapies in Medicine **23**(4): 555-561.

The purpose of this study was to investigate the efficacy of a standardized polyherbal formulation consists of aqueous extracts from six herbs, in patients with Type-2 diabetes mellitus. Design Randomized, active control study. Interventions 93 patients, newly diagnosed with Type-2 diabetes mellitus were randomly allocated to group 1 (received polyherbal capsules containing six herbal extracts viz. Berberis aristata, Cyperus rotundus, Cedrus deodara, ***Emblica officinalis***, ***Terminalia chebula*** and ***Terminalia bellirica***, 500 mg/day, up titrated weekly to

a maximum of 3 g/day) and group 2 (received Metformin 500 mg/day, up titrated weekly to a maximum of 2 g/day). Main outcome measures The primary endpoint was effect on the change from baseline in blood glucose (Fasting blood Glucose and Postprandial blood glucose), and glycosylated hemoglobin (HbA1c). The secondary outcome includes the effect on lipid levels, liver enzymes and renal function test. Results After 24 weeks, mean laboratory measured fasting and post prandial blood glucose showed a decrease of 25.52% and 24.22% in polyherbal formulation (PHF) treated group, compared to 31.46% and 24% decrease in Metformin treated group (estimated treatment difference −10.8; 95% CI −22.63 to 1.03 and −0.36; −12.1 to 11.38, respectively). Reduction in HbA1c was also similar for PHF and Metformin (estimated treatment difference 0.01; 95% CI −0.51 to 0.53). However, the decrease in the mean total cholesterol level was more pronounced in PHF treated group (estimated mean difference 61.3; 95% CI 55.32 to 67.28) than Metformin treated group (estimated mean difference 41.12; 95% CI 34.92 to 47.32). Also, there was statistical significance between the treatment groups in total cholesterol level at the end of six months treatment (estimated treatment difference 20.18; 95% CI 12.34 to 28.02). Conclusion The study demonstrated that daily intake of this PHF decreased the glycemic level and improved lipid homeostasis, while maintaining the other serum biochemical levels to the normal, and therefore it may be useful for the patients with Type-2 diabetes. This trial is registered in the Clinical Trials Registry – India (CTRI) (CTRI/2014/03/004490).

4. Bajaj, N. and S. Tandon (2011). "**The effect of *Triphala* and Chlorhexidine mouthwash on dental plaque, gingival inflammation, and microbial growth.**" International Journal of Ayurveda Research **2**(1): 29-36.

The objective of this study was to ascertain the effects of a mouthwash prepared with ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***) on dental plaque, gingival inflammation, and microbial growth and compare it with commercially available Chlorhexidine mouthwash. This study was conducted after ethics committee approval and written consent from guardians (and assent from the children) were obtained. A total of 1431 students in the age group 8-12 years, belonging to classes fourth to seventh, were the subjects for this study. The Knowledge, Attitude and Practice (KAP) of the subjects was determined using a questionnaire. The students were divided into three groups namely, Group I (n = 457) using *Triphala* mouthwash (0.6%), Group II (n = 440) using Chlorhexidine mouthwash (0.1%) (positive control), and Group III (n = 412) using distilled water (negative control). The assessment was carried out on the basis of plaque scores, gingival scores, and the microbiological analysis (Streptococcus and lactobacilli counts). Statistical analysis for plaque and gingival scores was conducted using the paired sample t-test (for intragroup) and the Tukey's test (for intergroup conducted along with analysis of variance test). For the Streptococcus mutans and Lactobacillus counts, Wilcoxon and Mann-Whitney test were applied for intragroup and intergroup comparison, respectively. All the tests were carried out using the SPSS software. Both the Group I and Group II showed progressive decrease in plaque scores from baseline to the end of 9 months; however, for Group III increase in plaque scores from the baseline to the end of 9 months was noted. Both Group I and Group II showed similar effect on gingival health. There was inhibitory effect on microbial counts except Lactobacillus where *Triphala* had shown better results than Chlorhexidine. It was concluded that there was no significant difference between the *Triphala* and the Chlorhexidine mouthwash.

5. Baliga, M. S., S. Meera, B. Mathai, M. P. Rai, V. Pawar and P. L. Palatty (2012). "**Scientific validation of the ethnomedicinal properties of the Ayurvedic drug Triphala: A review**." Chinese Journal of Integrative Medicine **18**(12): 946-954.

Triphala, a herbal formula composed of the three fruits of ***Terminalia chebula*** Retz. (Haritaki, Family: Combretaceae), ***Terminalia bellirica*** Roxb. (Bibhitaki, Family: Combretaceae) and ***Phyllanthus emblica*** Linn. or ***Emblica officinalis*** Gaertn. (Amalaki or the Indian gooseberry, Family: Euphorbiaceae) is considered to be a universal panacea in the traditional Indian system

of medicine the Ayurveda. It has been described in the Ayurveda text as a "Rasayana' and to rejuvenat the debilitated organs. Ayurvedic physicians use Triphala for many ailments but most importantly to treat various gastrointestinal disorders. Scientific studies carried out in the past two decades have validated many of the ethnomedicinal claims and researches have shown Triphala to possess free radical scavenging, antioxidant, antiinflammatory, antipyretic, analgesic, antibacterial, antimutagenic, wound healing, anticariogenic, antistress, adaptogenic, hypoglycaemic, anticancer, chemoprotective, radioprotective and chemopreventive effects. Clinical studies have also shown that Triphala was found to have good laxative property, to improve appetite and reduce gastric hyperacidity. Studies have also shown that Triphala was effective in preventing dental caries and that this effect was equal to that of chlorhexidine. The current review addresses the validated pharmacological properties of Triphala and also emphasizes on aspects that need further investigation for its future clinic application.

6. Banerjee, P., S. Maity, T. Das and S. Mazumder (2011). "**A double-blind randomized placebo-controlled clinical study to evaluate the efficacy and safety of a polyherbal formulation in geriatric age group: A phase IV clinical report.**" Journal of Ethnopharmacology **134**(2): 429-433.

Aim of the study: We sought to determine the efficacy as antioxidant and safety profile of the polyherbal formulation in geriatric patients of eastern India. Materials and methods: The study was double-blind, randomized including placebo controlled and was approved by the ethical committee of SSKM hospital. Geriatric patients attending the OPD (outpatient department) of SSKM hospital formed the study group. The patients were randomized to receive either the polyherbal formulation or the identical-looking placebo at a dose of 2 tablets twice daily for a period of 6 months. Each tablet of polyherbal formulation contained Capparis spinosa – 13.8 mg, *Terminalia arjuna* – 6.4 mg, *Withania somnifera* – 30 mg, *Asparagus racemosus* – 20 mg, *Glycyrrhiza glabra* – 20 mg, *Centella asiatica* – 20 mg, ***Terminalia chebula*** – 15 mg and *Curcuma longa* – 5 mg. Follow-up of patient status was done monthly. The clinical parameters were assessed before and after 6 months of medication or placebo intake. The results showed that significant rejuvenation of the anti-oxidant property which is determined by the enzymatic and non enzymatic anti oxidants, superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase, reduced glutathione and malondialdehyde in the geriatric patients were seen in patients treated with Geriforte tablets as compared to patients treated with placebo and control group. There were no significant adverse effects experienced by cases in any group. Conclusion: Polyherbal formulation is effective in rejuvenating geriatric age group compared to the placebo. This formulation is safe and compliance to the treatment was good. In ancient Ayurveda the constituents of polyherbal formulation were prescribed for different diseases including cardiological, neurological, sepsis, etc.

7. Bhat, P. M. (2016). "**Study on the role and efficacy of Triphala Ghrita Aschyotan in Vataj Abhishyanda wrt Allergic Conjunctivitis**." International Journal of Ayurvedic Medicine **7**(2).

Allergic conjunctivitis is a common ophthalmic problem predominantly affecting the outdoor workers. The eyes are exposed to different environmental factors. The eye and eyelids are very common sites for allergic reactions. About 50% of conjunctivitis seen by primary physicians is allergic in nature. Vataj Abhishyanda is a clinical entity which can be correlated with allergic conjunctivitis. **Triphala** Ghrita Aschyotan helps to relieve the symptoms of Vataj Abhishyand w.r.t allergic conjunctivitis. Triphala Ghrita is a Vyadhi Pratyanik Dravya and helpful in topical eye allergies. Aim: To study the role and efficacy of Triphala Ghrita Aschyotan in Vataj Abhishyanda w.r. t. allergic conjunctivitis. Materials and Method: A total 60 patients of the age group 15-60 years presenting with signs and symptoms of Vataj Abhishyanda w.r.t allergic conjunctivitis were selected randomly from OPD of the department of Shalakyatantra, Government Ayurved College, Nanded (M.S.) within inclusion criteria and were treated in two groups. The 30 patients of trial group were treated with Triphala Ghrita Aschyotana and patients of control group in similar number were subjected to Ketotifen Fumarate eye drop. Results: The

trial drug Triphala Ghrita is equally effective as compared to Ketotifen eye drop. Trial drug provided more relief in symptoms like Sangharsha (Itching of eyes), which is the parameter of efficacy. Conclusion: Triphala Ghrita Aschyotan is an effective, safe and potent treatment of Vataj Abhishyanda w.r.t allergic conjunctivitis.

8. Bhati, H. and R. Manjusha (2015). "**Clinical study on evaluation of anti-cataract effect of Triphaladi Ghana Vati and Elaneer Kuzhambu Anjana in Timira (immature cataract).**" AYU (An international quarterly journal of research in Ayurveda) **36**(3): 283.

Senile cataract is the leading cause of blindness according to the World Health Report, 1998. There is no accepted medical treatment is available for cataract. In Ayurveda visual disturbances are described in the context of Timira, Kacha and Linganasha. Timira is an early stage characterized by blurring of vision and Linganasha is end stage where complete loss of vision occurs. Ancient scholars have advocated different Anjana application and oral medications in the Timira and Kacha stage. Aim was to study the efficacy of test drugs **Triphaladi Ghana Vati** and Elaneer Kuzhambu Anjana in immature cataract. Materials and Methods: In this trial patients having Senile Immature Cataract were randomized with equal probability to one of the two treatment Groups A and B (n = 20 each). In Group A Triphaladi Ghana Vati 500 mg internally for 3 months and in Group B Triphaladi Ghana Vati 500 mg internally and Elaneer Kuzhambu Anjana for local application were given. Assessment was done on the basis of blurring of vision, visualization of nonexisting things, difficulty in bright light and dim light or night vision, distant visual acuity, pinhole vision, best corrected visual acuity and cataract grading on slit lamp. Results: Both groups showed statistically significant changes in blurring of vision, difficulty in glare, daytime and bright light, distant visual activity, pinhole vision, and best-corrected visual acuity. Group B also showed significant changes in difficulty in night time, visualization of nonexisting things and in nuclear cataract. The study establishes that test drugs can reduce and control the progress of immature cataract, and combined therapy was found more effective. Chakshushya Rasayana, early diagnosis and proper management on Doshic lines can prevent arrest or delay senile cataract.

9. Bhattacharjee, R., S. Nekkanti, N. G. Kumar, K. Kapuria, S. Acharya and K. C. Pentapati (2015). "**Efficacy of *Triphala* mouth rinse (aqueous extracts) on dental plaque and gingivitis in children.**" Journal of Investigative and Clinical Dentistry **6**(3): 206-210.

The aim of the present study was to evaluate the efficacy of ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***) mouth rinse (aqueous) in the reduction of plaque and gingivitis among children. The study was a randomized, double-blinded, controlled trial, with a total of 60 school children (n = 30 in each group; *Triphala* and chlorhexidine groups). Plaque and gingival indices were used to evaluate baseline and follow-up plaque and gingivitis. A total of 57 children completed the study. Both chlorhexidine and *Triphala* groups showed significantly lower mean gingival and plaque index scores at follow up than baseline ($P < 0.001$). There was no significant difference in the percentage change in the mean gingival index between the two groups ($P = 0.826$). The percentage change in the mean plaque index was significantly higher in the chlorhexidine group compared to the *Triphala* group ($P = 0.048$). The effectiveness of *Triphala* in the reduction of plaque and gingivitis was comparable to chlorhexidine, and can be used for short-term purposes without potential side-effects. It is a cost-effective alternative in reducing plaque and gingivitis.

10. Biswas, N. R., S. K. Nainiwal, G. K. Das, U. Langan, S. C. Dadeya, P. K. Mongre, A. K. Ravi and K. P. Baidya (2003). "**Comparative randomised controlled clinical trial of a herbal eye drop with artificial tear and placebo in computer vision syndrome**." Journal of the Indian Medical Association **101**(3): 208-209+212.

A comparative randomised double masked multicentric clinical trial has been conducted to find out the efficacy and safety of a herbal eye drop preparation, itone eye drops with artificial tear

and placebo in 120 patients with computer vision syndrome. Patients using computer for at least 2 hours continuously per day having symptoms of irritation, foreign body sensation, watering, redness, headache, eyeache and signs of conjunctival congestion, mucous/debris, corneal filaments, corneal staining or lacrimal lake were included in this study. Every patient was instructed to put two drops of either herbal drug or placebo or artificial tear in the eyes regularly four times for 6 weeks. Objective and subjective findings were recorded at bi-weekly intervals up to six weeks. Side-effects, if any, were also noted. In computer vision syndrome the herbal eye drop preparation (that also contained ***Triphala*** ingredients) was found significantly better than artificial tear ($p<0.01$). No side-effects were noted by any of the drugs. Both subjective and objective improvements were observed in itone treated cases. So, itone can be considered as a useful drug in computer vision syndrome.

11. Chaudhari, V., M. Rajagopala, S. Mistry and D. Vaghela (2010). "**Role of Pradhamana Nasya and Trayodashanga Kwatha in the management of Dushta Pratishyaya with special reference to chronic sinusitis.**" AYU **31**(3): 325-331.

Dushta Pratishyaya is the chronic stage of Pratishyaya, which occurs due to neglect or improper management of the disease Pratishyaya. In modern science, chronic sinusitis can be correlated with Dushta Pratishyaya on the basis of the signs, symptoms, complications, and prognosis. Changing lifestyles, rapid urbanization, and the increase in cases of antibiotic resistance are responsible for the rise in the prevalence of sinusitis. In the present clinical study, 37 patients were registered and were randomly divided into three groups: A, B, and C; of the 37 patients, 31 completed the full course of treatment. In group A, Trayodashanga Kwatha with Madhu was given orally; in group B, Pradhamana Nasya with ***Trikatu*** + ***Triphala*** Churna was administered; and in group C (combined group), Pradhamana Nasya was administered initially, followed by oral Trayodashanga Kwatha with Madhu. Acharya Charaka has advised a combination of ***Trikatu*** (***Zingiber officinale***, ***Piper longum***, ***Piper nigrum***) and ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***) Churna for Pradhamana Nasya in the context of Pratishyaya Chikitsa. In group A, complete relief was observed in 10% of the patients; in group B, marked improvement was observed in 81.82% of patients; and in group C, marked relief was observed in 60% of patients. In comparison to other groups (Group A and Group B), Group C showed percentage wise better results in most of the symptoms.

12. Desai, A., M. Anil and S. Debnath (2010). "**A clinical trial to evaluate the effects of triphala as a mouthwash in comparison with chlorhexidine in chronic generalised periodontitis patient**." Indian Journal of Dental Advancements **2**(3): 243-248.

Ayurvedic drugs have been used since ancient times; oral rinses made from these are used in periodontal therapy. ***Triphala*** is one of these with wide spectrum of activity. Chlorhexidine is a bisguanide antiseptic, a potent antibacterial and anti plaque agent. 24 patients with chronic generalised periodontitis were recruited for the study and divided into three groups, group A patients treated with scaling and root planning, group B with SRP and prescribed to use Triphala as a mouthwash, group C-SRP and prescribed to use Chlorhexidine mouthwash. Patients were monitored for a period of 45 days. Triphala as a mouthwash showed significant reduction in periodontal indices when compared to SRP alone but no significant difference was noted between Triphala and Chlorhexidine group.

13. Deshpande, A., S. Tandon and N. Deshpande (2014). "**Low resource screening method of pre-cancerous lesions and its reversal by *Triphala* in teen-age Indian population.**" AYU **35**(2): 160-167.

Cancer screening is the main weapon for early detection at a pre-invasive or premalignant stage. It has been reported that over 12 million people use some form of tobacco, which is one of the high risk factors and has hence become an alarming world-wide problem. Aim was to evaluate

the effective diagnostic screening of disease in its early stage by inexpensive method and also to evaluate the effect of indigenous mouthrinse on reversal of pre-cancerous lesions. The screening for teenagers belonging to low socio-economic status was carried out. Suspected subjects were evaluated for the reversal of the lesions by use of Ayurvedic preparation as a mouthwash. From 13 to19 years working-child population of North India was selected for the study. Screening was performed by new method-visual inspection with acetic acid. The positive subjects were further investigated by pap smear and biopsy was done as a confirmatory histopathological report. In second phase, the subjects showing positive lesions were advised indigenous anti-cancer mouth rinse and its effect was evaluated after 6 month and 9 month of prescribing the rinse. The total 1095 children were screened (831 boys and 264 girls). Out of total 34 teenager boys were diagnosed, as acetowhite positive lesion. All the acetowhite positive lesions were found exclusively in males. Histological findings after 9 month use of ***Triphala*** (***Emblica officinalis*, *Terminalia chebula*, *Terminalia bellirica***) mouth rinse revealed no changes in cells in 23 (85.2%), hyperkeratinization in 2 (7.4%), hyperkeratinization and spongiosis was evident in 1 (3.7%), mild pleomorphism in 1 (3.7%) patient. Comparative evaluation from 0-9 month showed statistically highly significant test ($P < 0.01$). Use of different forms of tobacco and betel nut showed convincing relationship between developments of oral pre-cancerous lesions. ***Triphala*** was found to have great potential for reversal of these lesions.

14. Dhiman, K. S., R. Agarwal, G. Gopinathan and V. J. Shukla (2017). "**Optimization of Parisheka kriyakalpa (Procedure for closed eye irrigation) 3: A clinical study on acute conjunctivitis with Triphala decoction**." Indian Journal of Traditional Knowledge **16**(1): 107-112.

Scientific validation of any drug, therapy, protocol or procedure requires a standardized procedure of manufacturing process, execution of the protocol or therapeutic procedure for standardization if the formulation protocol or procedure has variables in literature and practice; they need to be optimized first following a systematic approach with prospective clinical application for further validation of the optimized data. Netra Parisheka/Seka foremost topical ocular therapeutic procedure had similar prevalence of variability in literature and practice. To meet the above criteria and to achieve the objective of standardization; optimization of SOP of Netra Parisheka procedure was thought to be the pre-requisite. Using all adopted parameters, total 51 (68 eyes) patients were enrolled out of which 50 (67 eyes) patients completed the study. Highly significant result with P value > 0.001 of Netra Parisheka procedure for a period of four days in dose of 750 ml, 500 ml; 250 ml for Vata, Pitta; Kaphaja Netra roga, respectively, temperature 37.2–37.7 oC, height 6-6.5 cm, duration 5–15 min, width 1.5-2.0 mm in Aamavastha of Netra roga (acute inflammatory condition of the eye) and shows its definite role of the procedure in the conversion of Aamavastha to Niraamavastha (remission of acute inflammatory sign) after 4th day. In some cases complete remission of symptoms was observed, i.e., 40%, while more than 70 % patients were having improvement in their signs and symptoms.

15. Gangamma, M., P. and M. Rajagopala (2010). "**A clinical study on "Computer vision syndrome" and its management with Triphala eye drops and Saptamrita Lauha**." AYU (An international quarterly journal of research in Ayurveda) **31**(2): 236-239.

American Optometric Association (AOA) defines computer vision syndrome (CVS) as "Complex of eye and vision problems related to near work, which are experienced during or related to computer use". Most studies indicate that Video Display Terminal (VDT) operators report more eye related problems than non-VDT office workers. The causes for the inefficiencies and the visual symptoms are a combination of individual visual problems and poor office ergonomics. In this clinical study on "CVS", 151 patients were registered, out of whom 141 completed the treatment. In Group A, 45 patients had been prescribed **Triphala** eye drops; in Group B, 53 patients had been prescribed the Triphala eye drops and Saptamrita Lauha tablets internally, and in Group C, 43 patients had been prescribed the placebo eye drops and placebo tablets. In

total, marked improvement was observed in 48.89, 54.71 and 06.98% patients in groups A, B and C, respectively.

16. Gopa, B., J. Bhatt and K. G. Hemavathi (2012). "**A comparative clinical study of hypolipidemic efficacy of Amla (Emblica officinalis) with 3-hydroxy-3-methylglutaryl-coenzyme-A reductase inhibitor simvastatin.**" Indian Journal of Pharmacology **44**(2): 238-242.

Objectives: To evaluate the efficacy of Amla in patients with type II hyperlipidemia and compare its hypolipidemic effects with those of simvastatin. Materials and Methods: Sixty type II hyperlipidemic patients of both sexes with plasma total cholesterol and low density lipoprotein level more than 240 mg% and 130 mg%, respectively, were selected for the trial. Out of total 60 selected patients, 40 were treated with Amla ***Emblica officinalis*** capsule (500 mg) daily for 42 days and 20 patients were given simvastatin capsule (20 mg) daily for 42 days. After the day of enrolment, all patients were followed up twice during the 42-day period. Blood samples were analyzed for various biochemical parameters and the values of Total Cholesterol (TC), Low Density Lipoprotein (LDL), High Density Lipoprotein (HDL), and Very Low Density Lipoprotein (VLDL) were measured before and after completion of the treatment with Amla and simvastatin. Cardiovascular parameters were recorded before and after completion of treatment. Results: Treatment with Amla produced significant reduction of TC ($P<0.0001$), LDL ($P<0.0001$), triglyceride (TG) and VLDL ($P<0.0002$), and a significant increase in HDL levels ($P<0.0002$). Similarly, treatment with simvastatin produced significant reduction of TC ($P<0.0001$), LDL ($P<0.0009$), TG and VLDL ($P<0.017$), and a significant increase in HDL levels ($P<0.0001$). Both treatments produced significant reduction in blood pressure; however, this beneficial effect was more marked in patients receiving Amla. Conclusion: In view of the above findings, it is suggested that Amla produced significant hypolipidemic effect along with a reduction in blood pressure. Addition of Amla to the currently available hypolipidemic therapy would offer significant protection against atherosclerosis and coronary artery disease, with reduction in the dose and adverse effects of the hypolipidemic agents.

17. Grover, S., S. Tewari, R. K. Sharma, G. Singh, A. Yadav and S. C. Naula (2016). "**Effect of subgingivally delivered 10% *Emblica officinalis* gel as an adjunct to scaling and root planing in the treatment of chronic periodontitis - A randomized placebo-controlled clinical trial**." Phytotherapy Research.

Emblica officinalis fruit possesses varied medicinal properties including cytoprotective antimicrobial, antioxidant, antiresorptive and antiinflammatory activity. The present study aimed to investigate the effect of subgingival application of indigenously prepared E.officinalis (Amla) sustained-release gel adjunctive to scaling and root planing (SRP) on chronic periodontitis. Forty-six patients (528 sites) were randomly assigned to control group (23;264): SRP +placebo gel and test group (23;264): SRP+10% E.officinalis gel application. Periodontal parameters: plaque index, gingival index, probing pocket depth (PPD), clinical attachment level (CAL) and modified sulcus bleeding index (mSBI) were assessed at baseline, 2 and 3-month post-therapy. Forty patients (470 sites) completed the trial. When test and control sites were compared, significantly more reduction in mean PPD, mSBI, number of sites with PPD=5-6mm, PPD≥7mm, CAL≥6mm and greater CAL gain were achieved in test sites at 2- and 3-month post-therapy ($p<0.05$). Locally delivered 10% E.officinalis sustained-release gel used as an adjunct to SRP may be more effective in reducing inflammation and periodontal destruction in patients with chronic periodontitis when compared with SRP alone.

18. Gupta, M., B. P. Shaw and A. Mukherjee (2008). "**Evaluation of antipyretic effect of a traditional polyherbal preparation: A double-blind, randomized clinical trial**." International Journal of Pharmacology **4**(3): 190-195.

The ancient Ayurvedic text Charak samhita of Indian medecine prescribes a specific group of ten plants having antipyretic properties with minimal side-effects. The aqueous extract of polyherbal ayurvedic preparation PD-10 (from the roots of ***Hemidesmus indicus*** R. Br.

(Asclepiadaceae), ***Rubia cordifolia*** L. (Rubiaceac), ***Cissampelos pareira*** L. (Menispermaceae), fruits of ***Terminalia chebula*** Retz. (Combretaceae), ***Emblica officinalis*** Gaertn. (Euphorbiaceae), ***Terminalia bellirica*** Roxb. (Combretaceae), ***Vitis vinifera*** L. (Vitaceae), ***Grewia asiatica*** L. (Tillaceae), ***Salvadora persica*** L. (Salvadoraceae) and granules of ***Saccharum officinarum*** L. (Poaceae)) exhibited significant antipyretic-analgesic properties during rodent experiments while exhibiting low toxicity and ulcerogenicity. The presence of flavonoids, tannins and polyphenols in this extract prompted this double-blind, randomized clinical trial on 60 patients using Aspirinv (60 mg kg-1 body weight per day) as the standard drug for comparison. The primary outcome measured was reduction in body temperature, while the secondary outcomes measured were prevalence of associated symptoms of fever and routine blood and urine parameters. A representative sample of patients was also studied for reduction in the level of Prostaglandin (PGE2). The clinical trial showed that fever was rapidly and substantially reduced after oral administration of PD-10 and this antipyretic effect was more sustained and highly significant when compared to Aspirin. Many associated symptoms of fever also exhibited significant reductions when PD-10 was administered as compared to Aspirin. Prostaglandin levels also registered a substantial decrease during treatment with the test drug.

19. Kamal, R. and S. Aleem (2009). "**Clinical evaluation of the efficacy of a combination of zanjabeel (*Zingiber officinale*) and amla (*Emblica officinalis*) in hyperlipidaemia**." Indian Journal of Traditional Knowledge **8**(3): 413-416.

In Unani System of Medicine, many drugs (single drugs as well compound formulations) are used for the purpose of reducing body weight and treating the obesity (Muhazzil). ***Emblica officinalis*** or Indian gooseberry (amla) & ginger (Zanjabeel) are among these medicines. Since these drugs are useful in obesity, these can also be proved beneficial in lowering increased concentration of plasma lipids or treating hyperlipidaemia. Their efficacy has also been proved pharmacologically and these are documented as good hypolipidaemic as well as antioxidant natural agents. The combination of drugs was found to be significant in lowering the level of serum total cholesterol, serum tryglycerides, serum LDL-cholesterol, serum VLDL-cholesterol and in increasing the level of serum HDL-cholesterol in patients of primary hyperlipidaemia.

20. Kamali, S. H., A. R. Khalaj, S. Hasani-Ranjbar, M. M. Esfehani, M. Kamalinejad, O. Soheil and S. A. Kamali (2012). "**Efficacy of 'Itrifal Saghir', a combination of three medicinal plants in the treatment of obesity; A randomized controlled trial.**" DARU, Journal of Pharmaceutical Sciences **20**(1).

Herbal combination of Itrifal Saghir or ***Triphala*** (***Emblica officinalis, Terminalia chebula, Terminalia bellirica***) has been widely used in traditional medicine. And brings health benefits such as antioxidant effect and scavenger of hydroxyl radicals and nitric oxide radicals activity and substantiated in traditional medicine a anti-obesity. In this study authors aimed to assess the efficacy of this herbal medicinal on reduction of weight and body mass index (BMI) of simple obese subjects in comparison with placebo. Obese subjects aged between 16 and 60 years were selected for 12-week, double-blind, randomized, placebo-controlled trial using a parallel design. Subjects were randomly assigned to take 5 grams of either the Itrifal Saghir (n = 31) or placebo (n = 31), 2 times daily for 12 weeks. Measures of body weight, BMI, waist circumference (WC), hip circumference (HC), were assessed at baseline and once every four weeks during the 12 week treatment period. The safety was evaluated by means of measuring the liver and kidney function. Homeostasis model of insulin resistance (HOMA-IR) was calculated as [fasting insulin (μU/mL) × fasting glucose (mmol/L)/22.5]. Compared to placebo group, in treatment group the mean difference of effective weight loss was 4.82Kg (CI95% 3.52 - 6.11, $\rho < 0.001$), the mean of decrease in waist circumference was 4.01 cm (CI 95% 2.13 - 5.90, $\rho < 0.001$), and the mean decrease in hip circumference was 3. 21 cm (CI 95% 1.96 - 4.45, $\rho < 0.001$) in treated subjects. No adverse effects or significant changes in liver and kidney function tests were observed in both placebo and treated groups. Itrifal Saghir appears to produce a positive effect on weight loss in obese subjects.

21. Katakdound, S. D. (2015). "**A randomised controlled clinical trial to evaluate effect of Ayurvedic formulation in postnatal care.**" Journal of Ayurveda and Holistic Medicine (JAHM) **3**(1).

Aim was to evaluate postnatal care with Ayurvedic medicine as the basic concept behind this clinical trial. In the present study 20 uncomplicated vaginally delivered patients with episiotomy were taken from the study centre and divided into two groups. In Group A (n=10) patients were treated with Gandhak Rasayanavati, Sookshma ***Triphalavati*** & ***Triphala*** **Kwath** containing ***Emblica officinalis*****,** ***Terminalia chebula*****,** ***Terminalia bellirica*** & in Group B (n=10) Tab. Ciprofloxacin + Tinidazole (500+200) mg, Tab Serratiopeptidase 10mg, Betadine ointment & liquid Dettol for 7 days and results were observed. In observation clinical findings were noted on 0th,3rd, 6th & 9th day. Statistical analysis used: The improvement in the cardinal symptoms were compared and analyzed statistically between the end of the treatment and baseline by using student's paired 't' test. The investigations also analyzed using student's unpaired 't' test. Results: In the GroupA no generalized or localized sepsis observed in any patient. Quality of wound healing, involution of uterus, nature of lochia and local tenderness shows statistically equal 't' value i.e. 0, 0.710, 0.534 and 0.599 respectively when compared with GroupB. It can be concluded that the Ayurvedic drugs are significantly effective in postnatal care when compared with modern drugs to combat infections. Hence Gandhak Rasayanavati, Sookshma *Triphala*vati & *Triphala* Kwath is reliable to use in postnatal care.

22. Kizhakkeveettil, A., P. S. Jayagopal and K. Rose (2011). "**Hypercholesterolemia and Ayurvedic Medicine: A Case Report.**" Topics in Integrative Health Care **2**(2): ID: 2.2006.

Over the last two decades there has been an increasing emphasis placed on screening for high cholesterol and adopting interventions to reduce cholesterol levels in order to reduce the risk of heart disease. The high costs and side effects of hypercholesterolemia medications have led many people to search for alternate treatments. Only a few studies have been conducted to evaluate the effect of Ayurvedic herbal medicine formulae on hypercholesterolemia. The objective of this article is to describe a case where Ayurvedic herbs appeared to have been helpful in the management of hypercholesterolemia. Clinical Features: This patient was a 46-year-old woman who had been diagnosed with hypercholesterolemia two years prior to presentation. She had not responded to conventional treatment. She was treated for eight months with the Ayurvedic formulae Kaishora Guggulu, ***Triphala*** and a custom made herbal tea mix. Ayurvedic treatment for this patient consisted solely of the use of herbal formulae over an eight-month period. Three preparations were prescribed for the first 4 months. 1.Kaishora Guggulu: This formula consists of the following ingredients: Haritaki Fruit (***Terminalia chebula***), Vibhitaki Fruit (***Terminalia bellirica***), Amalaki Fruit (***Emblica officinalis***), Guduchi Stem (***Tinospora cordifolia***), Ginger Root (***Zingiber officinale***), Pippali Fruit (***Piper longum***), Black Pepper Fruit (***Piper nigrum***), Vidanga (*Embelia ribes*), Danti Root (*Baliospermum montanum*), Trivruth Root (*Operculina turpethum*), Guggulu Resin (*Commiphora mukul*), The patient was prescribed four 300 mg tablets per day. Two tablets were taken after breakfast and two tablets after dinner. 2. *Triphala* : This formula consists of the following ingredients: Haritaki Fruit (*Terminalia chebula*), Vibhitaki Fruit (*Terminalia bellirica*), Amalaki Fruit (*Emblica officinalis)*. The patient was prescribed three 300 mg tablets per day to be taken after dinner. 3. Custom prepared Herbal Tea blend: This formula consists of the following ingredients: *Coriandrum sativuam* -1TBS, *Cuminum cyminum* -1TBS, *Foeniculum vulgare*- 1 TBS, *Curcuma longa* -1/2 TBS, *Elettaria cardamomum* -1/2TBS. Her total cholesterol dropped from 270 to 208 mg/dl, her LDL dropped from 191 to 146 mg/dl, and her HDL rose from 57 to 63 mg/dl. There were no side effects reported. This case demonstrates the use of Ayurvedic herbs in the management of hypercholesterolemia. Further high quality studies with randomized clinical trials should be conducted to better understand the effectiveness of Ayurvedic treatment for hypercholesterolemia.

23. Kumar, A. and A. K. Garai (2012). "**A clinical study on Pandu Roga, iron deficiency anemia, with Trikatrayadi Lauha suspension in children.**" Journal of Ayurveda and Integrative Medicine **3**(4): 215-222.

Nutritional iron deficiency is the most common cause of anemia in India. The nearest correlation of iron deficiency anemia (IDA) can be made with Pandu Roga in Ayurveda. As the IDA is a very common prevalent disease in the society and the side effects of oral allopathic iron preparations are very common, therefore to get a better alternative, an Ayurvedic herbomineral medicine, the Trikatrayadi Lauha, was subjected to a clinical trial in children suffering from IDA. Trikatrayadi Lauha suspension is an Ayurvedic herbomineral drug. The trial drug contains herbal drugs like ***Triphala*** (***Emblica officinalis*, *Terminalia chebula*, *Terminalia bellirica***), which is rejuvenative; ***Trikatu*** (***Zingiber officinale, Piper longum, Piper nigrum***), which is an appetizer; and Trimada, which is digestive. Herbal ingredients in the trial drug may increase the bioavailability of Mandura bhasma and lauha bhasma which are important contents of the formulation. Aim was evaluation of safety and efficacy of the compound Trikatrayadi Lauha (that also contains *Triphala* and *Trikatu* amon other herbs) suspension in children with IDA. Settings and Design: Randomized, double-blind placebo-controlled clinical study. The study was conducted on 123 children of IDA for a period of 10 weeks. Clinical features and hematological parameters were documented before, during and after treatment. Observations of the study were analyzed and findings were evaluated by using statistical methods (Student's t test).The present study shows that the trial drug Trikatrayadi Lauha suspension is effective to improve clinical features and hematological parameters significantly. The medicine is effective to increase the hemoglobin level 1.94 g/dL (8.52 -10.46 g/dL, $P < 0.001$) in 5 weeks and 3.33g/dL (8.52 -11.85g/dL, $P < 0.001$) in 10 weeks. No adverse effect of the trial drug was observed during the study. In conclusions, the results suggest that Trikatrayadi Lauha is significantly effective in the management of IDA in children.

24. Kumari, M., S. B. Naik, N. S. Rao, S. S. Martande and A. R. Pradeep (2013). "**Clinical efficacy of a herbal dentifrice on dentinal hypersensitivity: A randomized controlled clinical trial.**" Australian Dental Journal **58**(4): 483-490.

Dentinal hypersensitivity is a common problem and there is a growing interest in herbal based formulations for the treatment of oral diseases. This study was conducted to assess the efficacy of a commercially available novel herbal dentifrice in reduction of dentinal hypersensitivity. A total of 73 subjects (38 males and 35 females; aged 25-60 years) were randomly divided into two groups: Group 1-a placebo dentifrice (The Himalaya Drug Company and Group 2-(test group), a commercially available herbal dentifrice (Hi Ora K, The Himalaya Drug Company Research and Development, Makali, Bangalore) containing ***Triphala*** (***Emblica officinalis*, *Terminalia chebula*, *Terminalia bellirica***) and ***Trikatu*** (***Zingiber officinale, Piper longum, Piper nigrum***) among other ingredients. Sensitivity scores for controlled air stimulus and cold water were recorded at baseline, 6 weeks and 12 weeks. The test group was found to be significantly better compared to the placebo group at the end of 6 and 12 weeks in reduction of dentinal hypersensitivity. The novel herbal dentifrice can be recommended for treatment of dentinal hypersensitivity.

25. Kumari, M., S. B. Naik, S. S. Martande, A. R. Pradeep and P. Singh (2014). "**Comparative efficacy of a herbal and a non-herbal dentifrice on dentinal hypersensitivity: a randomized, controlled clinical trial.**" Journal of Investigative and Clinical Dentistry: DOI: 10.1111/jicd.12133.

Dentinal hypersensitivity (DH) is a common painful condition of the teeth of adults. The present study was conducted to assess and compare the efficacy of a commercially-available novel herbal dentifrice with a non-herbal potassium nitrate in the reduction of DH. A total of 145 individuals (73 males and 72 females; aged 25–60 years) were divided into three groups randomly: (a) group 1: a placebo dentifrice; (b) group 2: a commercially-available herbal dentifrice; and (c) group 3: 5% non-herbal potassium nitrate. The sensitivity scores for controlled

air stimulus and cold water were recorded at baseline, 6 weeks, and 12 weeks. Both groups 2 and 3 were found to be significantly better, as compared to the placebo group at the end of 6 and 12 weeks in the reduction of DH. Group 2 also showed comparable results in the reduction of DH when compared to group 3. The herbal dentifrice containing ***Triphala*** (***Emblica officinalis*, *Terminalia chebula*, *Terminalia bellirica***) and ***Trikatu*** (***Zingiber officinale, Piper longum, Piper nigrum***) among other ingredients showed comparable results to the non-herbal dentifrice and can be recommended for the treatment of DH.

26. Kundu, P. K. and P. Chatterjee (2010). "**Meta-analysis of *Diabecon* tablets: Efficacy and safety outcomes from 15 clinical trials in Diabetes Mellitus.**" Indian Journal of Clinical Practice **20**(9): 653-659.

Diabecon is a polyherbal formulation, which contain the extracts of *Balsamodendron mukul, Gymnema sylvestre, Pterocarpus marsupium, Glycyrrhiza glabra, Casearia esculenta, Eugenia jambolana, Asparagus racemosus, Boerhaavia diffusa, Sphaeranthus indicus,* ***Tinospora cordifolia****, Swertia chirata, Tribulus terrestris, Phyllanthus amarus, Gmelina arborea, Gossypium herbaceum, Berberis aristata, Aloe vera*, Shilajeet and powders of *Momordica charantia*, ***Piper nigrum****, Ocimum sanctum, Abutilon indicum, Curcuma longa, Rumex maritimus* and ***Trikatu*** (***Zingiber officinale, Piper longum, Piper nigrum***) as its main constituents. The aim of this meta-analysis was to analyze the efficacy and safety of Diabecon tablets in 435 patients with diabetes mellitus (DM) as reported in 15 published clinical study reports, which also includes two double-blind studies, published between 1993 and 2004. Diabecon tablets were given as two tablets b.i.d or t.i.d for 12-60 weeks. Improvement in various parameters including fasting blood sugar (FBS), postprandial blood sugar (PPBS), glycated hemoglobin, plasma insulin levels as well as protective effects on diabetic complications including hyperlipidemia, microalbuminuria and diabetic retinopathy were evaluated. Changes in various study parameters from baseline values and values at the end of the study were pooled and analyzed cumulatively using paired 't' test. Statistical analysis was carried out using GraphPad Prism software (version 4.03). Of the 435 diabetic individuals, 332 received only Diabecon as therapy, 69 patients received Diabecon in addition to insulin/oral hypoglycemic agents (OHAs), and remaining 34 patients received placebo. Results of these studies indicate significant beneficial effects in patients given Diabecon tablets. Significant improvements were observed in FBS, PPBS, glycated hemoglobin, plasma insulin, microalbuminuria, etc. Similar results were observed in studies that used Diabecon along with OHA or insulin in OHA-resistant cases. Diabecon treatment also significantly improved lipid profile [total cholesterol, HDL-cholesterol (HDL-c), LDL-cholesterol (LDL-c)] as well as diabetic retinopathy and microalbuminuria. Adverse effects were seen in only two out of 332 patients treated with Diabecon; these were mild in nature and did not necessitate drug withdrawal. The findings of 15 clinical trials with Diabecon clearly indicated the beneficial effects in DM and related complications with additional advantage of long-term safety.

27. Kurian, G. A., V. Manjusha, S. S. Nair, T. Varghese and J. Padikkala (2014). "**Short-term effect of G-400, polyherbal formulation in the management of hyperglycemia and hyperlipidemia conditions in patients with type 2 diabetes mellitus.**" Nutrition **30**(10): 1158-1164.

Salacia oblonga, ***Tinospora cordifolia***, ***Emblica offinalis***, *Curcuma longa* and *Gymnema sylvestre* are Ayurvedic medicinal plants reported to lower plasma glucose levels in animal models. As no clinical validations of those extracts for efficacy have been conducted this study evaluated the effect of polyherbal combination in patients with type 2 diabetes mellitus. Authors screened 250 patients enrolled in a diabetes mellitus screening camp held at District Ayurvedic Hospital, Kottayam, Kerala, India. Of these, 89 patients diagnosed with type 2 diabetes mellitus and 50 healthy volunteers of similar age group were included in the study. Patients were treated with a polyherbal combination drug namely G-400 (1000mg/d) for 8wk with a follow-up of 2wk interval. Fasting and postprandial blood glucose levels measured after 8 wk of G-400 treatment

in patients were significantly lower. Indeed diabetic rats showed similar protection with G-400 administration. Furthermore, glycosylated hemoglobin, serum total cholesterol, both high- and low-density lipoprotein cholesterol, and triglycerides showed a significant improvement in G-400-administered patients. Toxicologic profile of the drug was assessed by analyzing the enzyme activities of alkaline phosphatase and alanine aminotransferase along with the concentration of blood urea nitrogen and creatinine in blood and found insignificant change compared with control. Short-term supplementation of G-400 not only attenuates the hyperglycemia, but also acts as hypolipidemic agent in patients with diabetes. Further study should be done for the long-term effect of the drug in larger populations.

28. Kusaba, N., A. Takano, T. Kamiya, K. Yamaguchi, K. Takagaki, S. Tamaru and K. Tanaka (2015). "**Effects of *Terminalia bellirica* extract on postprandial serum triglyceride - Randomised, double blind, placebo controlled, crossover study.**" Japanese Pharmacology and Therapeutics **43**(8): 1175-1180.

A double-blind placebo controlled crossover clinical study was conducted on healthy adults volunteers to examine the effects of ***Terminalia bellirica*** extract on elevation of postprandial serum triglyceride. Methods: The subjects were 34 healthy adult volunteers (mean age of 22.1 ±2.0 years). The subjects were randomly divided to three groups and took a high fat meal (41.6 g fat) with test supplement containing 200 mg or 300 mg *Terminalia bellirica* extract (the 200 mg group, the 300 mg group), or a placebo supplement (the control group). Serum triglyceride was measured before and 2, 3,4, and 6 hours after intake of the high fat meal. Results: Compared to the control group, the 200 mg group and the 300 mg group had significantly lower serum triglyceride at 2 hours after the high fat meal and IAUC of postprandial serum triglyceride (each $P < 0.05$). These results suggested that the *Terminalia bellirica* extract had inhibitory effect on the elevation of postprandial serum triglyceride.

29. Kushwaha, S., A. Betsy and P. Chawla (2012). "**Effect of Ashwagandha (*Withania somnifera*) root powder supplementation in treatment of hypertension.**" Studies on Ethno-Medicine **6**(2): 111-115.

Ashwagandha (***Withania somnifera***) is widely used in Ayurvedic medicine, and it is one of the ingredients in many formulations to increase energy, improve overall health and longevity, and prevent disease. The main objective of the study was to analyze the efficacy of Ashwagandha root powder with water and with milk in treatment of hypertension. The experiment was conducted on 51 stress-oriented hypertensive subjects in the age group of 40 to 70 years, selected by purposive sampling. Subjects were divided into group I and group II. Supplementation of 2gm of Ashwagandha root powder was given to group I and group II with milk and water respectively in morning. Blood pressure was also recorded over a period of three months. Overall decrease in systolic blood pressure was found though it was non- significant. Further, decrease in systolic blood pressure was significant in group I, whereas decrease in diastolic blood pressure was significant in both the groups. Hence, supplementation of Ashwagandha with milk is recommended in treatment of stress- oriented hypertension.

30. Lalla, J. K., S. Y. Nandedkar, M. H. Paranjape and N. B. Talreja (2001). "**Clinical trials of ayurvedic formulations in the treatment of acne vulgaris.**" Journal of Ethnopharmacology **78**(1): 99-102.

Oral and externally used dermatological preparation for acne vulgaris employing herbal extracts have been developed and standardized, the herbal extracts used here were of the plants described in ayurvedic treatise like Bhavprakasha Nighantu and Charak Samhita. The efficacy of the treatment using the oral formulation with or without external preparation has been assessed through conduct of Phase II clinical trials in 53 patients for 4 weeks in a randomized, double-blind, placebo-controlled fashion and following Good Clinical Practices guidelines. The results were statistically analyzed and indicated that combination of use of internal and external preparation showed better efficacy as compared to the use of oral formulation alone. Drug terms used in the study include *Aloe barbadensis* extract; *Azadirachta indica* extract; *Curcuma*

longa extract; *Hemidesmus indicus* extract; *Terminalia arjuna* extract; ***Terminalia chebula*** extract; and ***Withania somnifera*** extract.

31. Lekurwale, P., K. Pandey and P. Yadaiah (2010). "**Management of Amavata with 'Amrita Ghrita': A clinical study.**" AYU **31**(4): 430.

Amavata is a disease caused due to the vitiation or aggravation of Vayu associated with Ama. Vitiated Vayu circulates the Ama all over the body through Dhamanies, takes shelter in the Shleshma Sthana (Amashaya, Sandhi, etc.), producing symptoms such as stiffness, swelling, and tenderness in small and big joints, making a person lame. The symptoms of Amavata are identical to rheumatism, which include rheumatoid arthritis and rheumatic fever. It is observed that rheumatism is an autoimmune disorder, which is among the collagen disorders having strong and significant parlance with Amavata. Various drug trials were already carried out on Amavata, yet there is a lacuna in the management of Amavata. Hence, in the present clinical study, 28 patients were selected and kept on 'Amrita Ghrita'. Preparation of Amrita Ghrita: Before the preparation, Murchhana of Ghrita10 was done with Amalaki (***Emblica officinalis***), Bibhitaki (***Terminalia bellirica***), Haritaki (***Terminalia chebula***), Nagarmotha (*Cyperus rotundus*), Haridra (*Curcuma longa*), and Nimbu ras (*Citrus media*). Amrita Ghrita was prepared in the college pharmacy with the following ingredients: Ghrita (Murchhita) 10 kg, Shunthi kalka (***Zingiber officinale***) 1 kg 660 g, Guduchi quath (***Tinospora cordifolia***) 40 lit. All the patients were investigated for complete blood count (CBC), rheumatoid arthritis (RA) titer, Antistreptolysin O (ASO) titer, C-reactive protein (CRP) titer, platelet count, urine routine, and microscopic, before and after treatment. The collected data was distributed according to age, sex, and prakruti, and a t-test was applied for the clinical assessment of the subjective and objective parameters of 'Amrita Ghrita,' and it has shown significant reduction in the positivity of the RA titer ($t > 5.09$, at the 0.001% level), ASO titer ($t > 4.08$, at the 0.001% level), and CRP titer ($t > 4.82$, at the 0.001% level), and weight gain ($t > 5.12$, at the 0.001% level), as also an increase in Hb% ($t > 9.22$, at the 0.001% level), and platelet count ($t > 5.90$, at the 0.001% level), and decrease in ESR ($t > 9.70$, at the 0.001% level).

32. Londhe, P. (2015). "**Udaraprashamanartha Amalakyadi Kwatha in Alcoholic Liver Disease.**" International Journal of Ayurvedic Medicine **6**(1): 115-121.

Alcoholic liver disease is a term that encompasses the hepatic manifestations of alcohol overconsumption, including fatty liver, alcoholic hepatitis, and chronic hepatitis with hepatic fibrosis or cirrhosis. Alcoholic liver disease (ALD) is the most prevalent cause of advanced liver disease. However, there has been limited research investment into ALD despite its significant burden on the health. Many patients of ALD having the clinical manifestations viz.ascites, hepatitis etc. used to visit the OPD of Dr. M.N. Agashe hospital, Satara.Hence, being an Ayurvedic hospital it was decided to work upon ALD with some Ayurvedic medicines. For that total 30 patients of ALD were selected and treated with 'AmalakyadiKwatha' (containing Amalaki (***Emblica officinalis***), Haritaki (***Terminalia chebula***) and Guduchi (***Tinospora cordifolia***) and Katuki (*Piccrorhiza kurroa*) in equal proportion. The formulation was given in the dose of 20 ml twice a day for the duration of one month. All the necessary parameters along with required investigations were assessed. In the results, weight of the patients was reduced by 12.13%. The parameters like abdominal girth (7.13 %↓), distance between umbilicus and xiphisternum (17.34 %↓), distance between umbilicus and pubis (19.18 %↓), distance between umbilicus and right anterior superior iliac crest (19.55 %↓), distance between umbilicus and left anterior superior iliac crest (16.83 %↓) showed highly significant results. The biochemical parameters such as Bilirubin, SGPT and SGOT also showed significant reduction in their levels. Hence, it can be said that Aamlakyadi kwath can be a good option for disease like ALD instead of repeated abdominal paracentesis.

33. Lone, A. H., T. Ahmad and A. H. Naiyar (2011). "**Clinical evaluation of efficacy of *Majoon Ushba* and *Roghane Hindi* in the management of psoriasis: A randomized single-blind, placebo-controlled study.**" Journal of Ayurveda and Integrative Medicine **2**(1): 26-31.

Psoriasis is a common dermatological disease affecting up to 1-2% of the world's population. It is associated with both organic and psychosocial complications like psoriatic arthropathy, nephritis, infection, hyperuricemia, hypoproteinemia, depression, and stress, and is responsible for hindering patients' daily activities. The present study was conducted to assess the safety and efficacy of two pharmacopeial Unani formulations (Majoon Ushba and Roghane Hindi) in the management of psoriasis on scientific parameters. Composition of *Majoon Ushba* contains many herbs including Post balela (***Terminalia bellirica***), Halela siyah (***Terminalia chebula***), Post halela zard (***Terminalia chebula***). Composition of *Roghane Hindi* includes among others Halela siyah (*Terminalia bellirica*). Thirty diagnosed psoriasis patients, satisfying the inclusion criteria, were selected for a randomized, single-blind, placebo-controlled study in the Department of Moalajat (Medicine), National Institute of Unani Medicine, Bangalore. The patients were divided by the method of Random Table Numbers into test and control groups after obtaining informed consent. The experimental group comprised 20 patients to whom Majoon Ushba 5 g was administered orally twice daily and Roghane Hindi was applied locally twice daily. The control group comprised 10 patients who were given placebo drugs orally and topically. The duration of the trial was 8 weeks and follow-up was done fortnightly. The severity of psoriasis and efficacy of the drug was assessed by the Psoriasis Area and Severity Index (PASI) Scale. The results of both groups were compared and analyzed statistically. The study showed significant reduction in the PASI score in the test group ($P < 0.01$) as compared to placebo. No obnoxious side effects were observed in the test group: toxicological parameters were within normal limits even after 2 months of treatment. It was therefore concluded that Majoon Ushba and Roghane Hindi are safe and effective in the management of psoriasis.

34. Mahajan, D. H., M. S. Bhoyar and S. S. Chaudhari (2013). "**Efficacy of triphala Kwath Yoni dhawan with triphala siddha ghrita pratisaran.**" International Journal of Research in Ayurveda and Pharmacy **4**(2): 249-252.

Episiotomy is the most common operative in obstetrics. Episiotomy wound care is essential as these wounds are difficult to heal. In this study, patients were randomly selected and allotted to trial group and control group, 30 for each group. In trial group **triphala** Kwatha Yonidhawan and triphala siddha ghrit pratisaran was given for 7 days and in control group patients were treated with perineal wash with Dettol and Betadine ointment locally for 7 days. The result was assessed with selected parameters. At the end of 7 days treatment, trial group showed significant result than control group.

35. Mahajan, S., P. Chauhan, S. K. Subramani, A. Anand, D. Borole, H. Goswamy and G. B. K. S. Prasad (2015). "**Evaluation of "GSPF kwath": A *Gymnema sylvestre*-containing polyherbal formulation for the treatment of human type 2 diabetes mellitus.**" European Journal of Integrative Medicine **7**(3): 303-311.

Since ancient times, plant-based herbal formulations have been used in Indian traditional medicine to treat diabetes. This observational study investigated the antihyperglycemic, antihyperlipidemic, and antioxidant potential of a Gymnema sylvestre polyherbal formulation ("GSPF kwath") in patients with type 2 diabetes mellitus. A before-and-after study of 32 human subjects with type 2 diabetes mellitus was carried out. Patients were administered "GSPF kwath" consisting of a mixture of 10 herbs: G. sylvestre (gurmar), Syzygium cumini (jamun seed), ***Phyllanthus emblica*** (amla), Curcuma longa (haldi), Pterocarpus marsupium (vijaysaar), ***Terminalia chebula*** (harad), Cassia fistula (amaltas), Picrorhiza kurroa (kutki), Swertia chirata (chirayita), and ***Terminalia bellirica*** (behada). Patients were administered 50 ml of aqueous extract derived from 10 g of "GSPF kwath" daily on an empty stomach for 6 months. The blood glucose levels were monitored monthly, and glycosylated hemoglobin, lipid profile and

biomarkers of oxidative stress, and liver and kidney function markers were measured at 3-monthly intervals. Daily administration of "GSPF kwath" regularly for 6 months resulted in significant reductions of blood glucose and glycosylated hemoglobin levels. There was also a significant increase in high-density lipoprotein cholesterol levels and concomitant decreases in total cholesterol, triglyceride, low-density lipoprotein cholesterol, and very-low-density lipoprotein levels. Patients exhibited a significant improvement in the biochemical markers for oxidative stress. The results suggest that the polyherbal formulation GSPF may have the potential to regulate both hyperglycemia and possibly hyperlipidemia. "GSPF kwath" may be a potentially safe and effective therapy for the treatment of type 2 diabetes mellitus.

36. Malhotra, R., V. Grover, A. Kapoor and D. Saxena (2011). "**Comparison of the effectiveness of a commercially available herbal mouthrinse with chlorhexidine gluconate at the clinical and patient level.**" Journal of Indian Society of Periodontology **15**(4): 349-352.

The key to good oral health is hidden in nature. Natural herbs like neem, tulsi, pudina, clove oil, ajwain, ***Triphala*** (***Emblica officinalis*****,** ***Terminalia chebula*****,** ***Terminalia bellirica***) and many more has been used since ages either as a whole single herb or as a combination against various oral health problems like bleeding gums, halitosis, mouth ulcers and preventing tooth decay. The aim of the study was to compare the efficacy of a commercially available herbal mouthrinse (Herboral) with that of chlorhexidine gluconate which is considered to be a gold standard as an anti-plaque agent. Materials and Methods: A randomized, two-group, parallel study as a 'de novo' plaque accumulation model was carried out on 50 subjects (23 males and 27 females). At baseline, all participants received a professional prophylaxis and were randomly assigned to the test (Herbal mouthrinse) and control (Chlorhexidine Gluconate) group. On the following three days, all subjects rinsed with 10 ml of the allocated mouthrinse twice daily for 1 min. They were asked to refrain from use of any other oral hygiene measures during the study. At the end of the experimental period, plaque was assessed and a questionnaire was filled by all subjects. Results: Chlorhexidine (mean plaque score=1.65) inhibited plaque growth significantly more than the herbal mouthrinse (mean plaque score=1.43, P<0.001). The results of the questionnaire showed that Herboral was preferred by patients for its taste, its convenience of use and taste duration (aftertaste). However, Chlorhexidine was considered to be more effective in reducing plaque as compared to Herboral. Herbal mouthrinse was found to be a potent plaque inhibitor, though less effective than Chlorhexidine Gluconate. However, it can serve as a good alternative for the patients with special needs as in case of diabetics, xerostomics, and so on.

37. Mamgain, P., A. Kandwal and R. K. Mamgain (2016). "**Comparative Evaluation of Triphala and Ela Decoction With 0.2% Chlorhexidine as Mouthwash in the Treatment of Plaque-Induced Gingivitis and Halitosis A Randomized Controlled Clinical Trial**." Journal of Evidence-Based Complementary & Alternative Medicine: DOI: https://doi.org/10.1177/2156587216679532

To evaluate Antigingivitis, Antiplaque and Antihalitosis effect of **Triphala** and Ela decoction. A randomized sample of 60 patients with plaque induced gingivitis was enrolled and equally divided into two groups group A and group B. Group A was given Trifala and Ela decoction and Group B Chlorehexidine mouthwash for 21 days twice daily. Gingival inflammation index, plaque index and Organoleptic scoring scale was recorded at baseline, 14th day and 21st day. Comparing the plaque index for Group A with group B the reduction in from baseline to 14 day was 42.59 % and 38.62% respectively while from baseline to 21 day was 56.20% and 68.57% respectively. On comparing Gingival index for group A with group B the reduction from baseline to 14 day was 31.95% and 38.62 % respectively while from baseline to 21 day was 69.95 % and 68.57% respectively. Halitosis Percentage reduction at 14th day from base line was 33.33% and 38.18%; at 21 day from baseline 66.66% and 72.72% respectively for group A and group B. No statistical significant difference for intergroup comparison was found using paired t test. Intra group analysis using unpaired t test was significant for all the indices at different time intervals.

Triphala and Ela decoction is organic, easy to prepare economical and equally effective as compared to chlorhexidine mouthwash.

38. Manikandan, T. S. and M. Jithesh (2012). "**A study on the efficacy of Sidharthakadi Yoga in the management of mania without psychotic symptoms-an uncontrolled clinical trial**." International Journal of Research in Ayurveda and Pharmacy **3**(6): 859-861.

Psychiatry in Ayurveda is called Bhootavidya. All mental disorders come under bhootavidya. Various types of treatment modalities are described in Ayurvedic classics for mental disorders. They include spiritual healing, psychotherapy and pharmacotherapy. Ayurvedic treatment is based on balancing of humors of body and mind. So, adverse effects are comparatively less. But, only a few of the formulations and treatment modalities are in practice today. There is much to be studied on. One among them is Sidharthakadi Yoga that also contains ***Triphala*** ingredients. The indication is in graha especially Asuragraha. Asuragraha has features like anger, hyperactivity, grandiosity and overconfidence. One of the disorders similar to this in modern psychiatry is mania. It is based on this view point, the present study was conducted. Sidharthakadi Yoga is prepared in two forms-as gutika for nasya and as tablet for intake. The study was conducted on 20 subjects. Nasya with Sidharthakadi Gutika was done for 7 days and tablets were given for intake for 30 days (3 tabs twice daily) after the course of nasya. Assessment was done before nasya, after 7 days of nasya and after 30 days of tablet intake. The assessment was done with Young Mania Rating Scale. It was observed that Sidharthakadi Yoga has significant effect in the management of mania without psychotic symptoms.

39. Manohar, P. R. (2012). "**Clinical evidence in the tradition of Ayurveda", In, S. Rastogi (ed.),** ***Evidence-Based Practice in Complementary and Alternative Medicine: Perspectives, Protocols, Problems and Potential in Ayurveda*****.** Springer-Verlag Berlin Heidelberg, pp. 67-78.

A careful study of the classical literature of Ayurveda provides compelling indications to believe that the practice of building clinical evidence was nurtured in the tradition of Ayurveda. Ayurveda exhibits the characteristics of a knowledge system and requires that observations are validated to be accepted as knowledge. The celebrated textbook on general medicine known as the *Charaka Samhita* remarks that the outcome of a clinical intervention is to be dismissed as accidental or due to chance if it cannot be substantiated with proper evidence and reasoning. Classical texts of Ayurveda also discuss about self-limiting diseases and the need to distinguish between the true effect and chance effect of a medical intervention. Classical treatments of Ayurveda are multimodal in nature and cannot be studied using conventional methods of clinical research. Appropriate research designs for both observational studies as well as randomized clinical trials need to be developed for meaningful evaluation of clinical interventions in Ayurveda. This chapter reviews the gaps in the current approaches to clinical research in Ayurveda and highlights the attempts that have been made to develop methodologies that are appropriate not only for Ayurveda but also such other systems of traditional, complementary, or alternative medicine. An elaborate discussion of the classical approach in building clinical evidence in the tradition of Ayurveda will also be attempted in the process.

40. Mashyal, P., H. Bhargav and N. Raghuram (2014). "**Safety and usefulness of Laghu shankha prakshalana in patients with essential hypertension: A self controlled clinical study**." Journal of Ayurveda and Integrative Medicine **5**(4): 227-235.

Yoga and Ayurveda texts emphasize the role of cleansing the bowel as an important component of management of hypertension (HTN). Observations during our clinical experience and pilot studies on Laghu shankha prakshalana kriya (LSP), a yogic bowel cleansing technique, appeared to be safe and complimentary. Objective: To test the safety and effectiveness of LSP in patients with essential hypertension. Materials and Methods: This self control study recruited 32 patients

with mild to moderate essential HTN admitted for a week long residential integrated yoga therapy program at the integrative health home in Bengaluru. Patients had a daily routine of 6 hours of integrated approach of yoga therapy (IAYT) module for HTN that included physical postures, relaxation sessions, pranayama and meditations. LSP, an additional practice, that involved drinking of luke-warm water (with or without a herbal combination, **triphala**) followed by a set of specific yoga postures that activates defecation reflex, was administered on 2nd (LSP without triphala) and 5th day (LSP with triphala). Assessments (sitting blood pressure and pulse rate) were done just before and after both the sessions of LSP. Secondary outcome measures such as body mass index (BMI), symptom scores, medication scores, fatigue, state and trait anxiety, general health and quality of life were assessed on 1st and 6th day of IAYT intervention. Results: There was significant (P < 0.001, paired t test) reduction in blood pressure (systolic and diastolic) and pulse rate immediately after both the sessions (LSP with and without triphala). There were no adverse effects reported during or after LSP. There was no significant difference between the two techniques (P < 0.505, independent samples t test), although the percentage change appeared to be higher after triphala LSP session. The number of visits to clear the bowel during the procedure was significantly higher after LSP with triphala than LSP without triphalβ. After weeklong IAYT, there were significant reductions in blood pressure, medication score, symptoms score, fatigue state and trait anxiety), scores of general ill health and increase in comfort level and quality of sleep. Conclusion: LSP (a part of IAYT) is a safe and useful procedure for patients with essential hypertension. LSP with triphala is more useful.

41. Mehra, R., R. Makhija and N. Vyas (2011). "**A clinical study on the role of Ksara Vasti and *Triphala* Guggulu in Raktarsha (Bleeding piles).**" AYU **32**(2): 192-195.

Shonitarsha is a common affliction which has been described and treated since the beginning of human civilization. Hemorrhoidal cushions are a part of normal anatomy but become pathological when swollen or inflamed. Treatment of piles in modern medicine is hemorrhoidectomy which results in repeated recurrences. Ayurveda provides a cure and prevents recurrences. Present study was carried out using a combination of Apamarga Kshara Basti and *Triphala*guggulu. The results of the clinical assessment of the indigenous formulation on 129 patients with bleeding piles are reported in this paper; 55 patients of a total of 129 showed marked relief. Ingredients of ***Triphalaguggulu*** tablets were ***Emblica officinalis*** (Amla), ***Terminalia chebula*** (Hareetaki), ***Terminalia bellirica*** (Vibheetaki), ***Piper longum*** (long pepper), and *Commiphora mukul* (Guggulu). ***Triphala*** is well known for its wound-healing quality. It also soothes the inflamed mucous layer and helps in checking the further infection. Guggulu is one of the best known anti-inflammatory herbs of Ayurveda. It also helps in healing the inflammation of fistula-in-ano. *Triphala* helps in easy bowel movements and relieves the constipation, a problem often troubling the people suffering from hemorrhoids. ***Piper longum*** helps in the digestion and assimilation of food nutrients.

42. Mohammad, K. and B. Larijani (2013). "**A systematic review of the antioxidant, anti-diabetic, and anti-obesity effects and safety of *Triphala* herbal formulation.**" Journal of Medicinal Plants Research **7**(14): 831-844.

Triphala (TPL) is one of the oldest used polyherbal preparations. It is comprised of ***Terminalia chebula***, ***Terminalia bellirica*** and ***Emblica officinalis***. A variety of uses, such as anti-obesity, of TPL have been described in Ayurvedic and Al-Qanoon Felteb literature. This study focuses on the efficacy and safety of *Triphala* in medicines, with any outcome in humans and animals; and described some of the mechanisms responsible for the many effects of this traditional medicine and main phytochemical analysis. The databases searched include Google Scholar, PubMed, Web of Science, the search terms were “TPL” and “trifala” without narrowing or limiting search elements. The benefits of TPL in vivo and in vitro include: antioxidant, anti-hypercholesterolemic, anti-diabetic, anti-obesity, chemo-preventive potential and anti-mutagenic activity, anti-inflammatory, antimicrobial, radioprotective effect,

immunomodulatory, improving wound healing, enteroprotective efficacies, anti gastric ulcers and nitric oxide scavenging activity. This herbal combination can have profound healing benefits in multi-organ systems. And, it exhibits a number of health benefits like antioxidant activity, lowers cholesterol. It is rich in Mg, K, Ca, Fe, Se and Zn, which enhance their bioavailability. TPL may be potent therapeutic agents for scavenging of NO and thereby help to explain, rejuvenating, adaptogenic, cardioprotective and neuroprotective activities of these traditional, and clinically used non toxic drugs.

43. Mukherjee, P. K., S. Rai, S. Bhattacharyya, P. K. Debnath, T. K. Biswas, U. Jana, S. Pandit, B. P. Saha and P. K. Paul (2006). "**Clinical study of '*Triphala*' - A well known phytomedicine from India.**" Iranian Journal of Pharmacology and Therapeutics **5**(1): 51-54.

Triphala' is an age old commonly used Ayurvedic powdered preparation in Indian systems of medicine. This well known formulation is made by combining ***Terminalia chebula***, ***Terminalia bellirica*** and ***Emblica officinalis***, in equal proportions based on the observation of Ayurvedic Formulary of India (AFI). The formulation is prescribed in the first line treatment of many aliments and is used as laxative, detoxifying agent and rejuvenator. To establish its clinical validity the present work was undertaken to evaluate its therapeutic potentials and adverse effects. The *Triphala* formulation was standardized by HPTLC (High Performance Thin Layer Chromatography), using Gallic acid as a marker and was subjected to clinical studies. After proper screening 160 patients of age between 16-52 years were selected for 45 days clinical study. The effectiveness of trial drugs were judged on the basis of the subjective and objective parameters. It was observed that the amount, frequency and consistency of stool were improved in *Triphala* treated group. The changes of odor, mucous, flatulence, belching and abdominal pain where also taken into account. The well being was assessed on the basis of the parameters like concentration, appetite, thirst, sleep, hyperacidity in arbitrary scoring system. *Triphala* was found to have good laxative property, help in management of hyperacidity and also improve appetite. No adverse effect was observed in the treated group when compared to normal patients. *Triphala* can be used effectively in the treatment of constipation and other gastric problems.

44. Munshi, R., S. Bhalerao, P. Rathi, V. V. Kuber, S. U. Nipanikar and K. P. Kadbhane (2011). "**An open-label, prospective clinical study to evaluate the efficacy and safety of TLPL/AY/01/2008 in the management of functional constipation.**" Journal of Ayurveda and Integrative Medicine **2**(3): 144-152.

Functional constipation is one of the most common gastrointestinal symptoms across the globe. Its high prevalence rate, economic burden, and adverse implications on the quality of life make constipation a major public health issue. Though various treatment options are available for the management of constipation, evidence for their efficacy and safety are limited. An open-label, prospective, interventional, and exploratory clinical trial was carried out to evaluate the efficacy and safety of "TLPL/AY/01/2008" in 34 patients suffering from functional constipation. "TLPL/AY/01/2008" is an Ayurvedic proprietary polyherbal formulation in powder form, containing Isabgol husk, Senna extract, and ***Triphala*** extract. This well known formulation is made by combining ***Terminalia chebula***, ***Terminalia bellirica*** and ***Emblica officinalis***. Administration of "TLPL/AY/01/2008" for 14 days showed a significant increase in mean weekly bowel movements from 10.19 ± 05.64 to 18.29 ± 05.72 ($P<0.05$). The mean average time spent on toilet for bowel evacuation reduced significantly from 11.02 ± 05.43 minutes (baseline value) to 08.70 ± 04.72 minutes on day 14 ($P<0.05$). Mean stool form score assessed on Bristol stool form scale was improved from 02.97 ± 00.48 (baseline value) to 04.61 ± 00.84 ($P<0.05$) on day 14. A significant improvement ($P<0.05$) was also noted in straining during defecation, sensation of incomplete evacuation, sensation of anorectal blockage, and other associated symptoms of functional constipation. The significant improvement in most of the above symptoms was endured for a post-treatment observatory period of one week. All the study patients showed

an excellent tolerability to the study drug. These findings suggest that "TLPL/AY/01/2008" is an effective, safe, and non-habit-forming herbal laxative formulation for the management of constipation. Comparative clinical studies with larger sample size would be able to confirm the above findings.

45. Nadkarni, M. A., S. Vyas, M. Baghel and B. Ravishankar (2010). "**Randomized placebo-controlled trial of Mustadi Ghanavati in hyperlipidemia.**" AYU **31**(3): 287.

Hyperlipidemia is one of the major lifestyle disorders. Its role has been appreciated in the manifestation of serious diseases like ischemic heart disease, diabetes, stroke etc. These lifestyle diseases are a result of lifestyle factors such as overnutrition etc., which have been referred to as the Santarpanjanya Vyadhis in the classical texts. Mustadi Ghanavti is a modified form of the classical formulation Mustadi Kwath that has been advocated by Acharya Charaka for the management of Santarpanjanya Vikaras. This placebo-controlled randomized trial of Mustadi Ghanavati (containing many herbs including ***Triphala***) was carried out on 61 patients suffering from hyperlipidemia; of the 61 patients, 50 completed the entire course of treatment. The results of the study revealed that Mustadi Ghanavati decreased serum cholesterol by 22.4%, serum triglycerides by 19.6%, serum LDL by 18.2%, and serum VLDL by 4.2%; serum HDL increased by 5.6%. Thus Mustadi Ghanavati was able to effect a total improvement of 58.8% in the lipid profile. It brought about mild improvement in 42.86% of patients and moderate improvement in 14.28% of patients. Mustadi Ghanavati was also found to have a significant effect on other subjective as well as objective parameters considered for the study. hese drugs relieve the body of excess of Kapha, Meda, Kleda, Vasa, and Sweda by diminishing their Drava Guna. Drugs like Neem, Patha, and *Triphala* bring about augmentation of the digestive fire, leading to proper formation of the Rasadi Dhatus. Patha, Musta, *Triphala*, Haridra, and Daruharidra digest the Ama Dosha present at the Jatharagni level as well as the Medodhatvagni level. Also drugs like *Triphala* (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***) and Khadir are Rasayana in nature, leading to the formation of optimal Dhatus, and thereby protect the body from injury due to vitiated Doshas.

46. Naiktari, R. S., P. Gaonkar, A. N. Gurav and S. V. Khiste (2014). "**A randomized clinical trial to evaluate and compare the efficacy of *Triphala* mouthwash with 0.2% chlorhexidine in hospitalized patients with periodontal diseases.**" Journal of Periodontal and Implant Science **44**(3): 134-140.

Triphala is a combination of three medicinal plants, extensively used in Ayurveda since ancient times (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***). *Triphala* mouthwash is used in the treatment of periodontal diseases because of its antimicrobial and antioxidant properties. The aim of this study is to compare the efficacy of *Triphala* mouthwash with 0.2% chlorhexidine in hospitalized periodontal disease patients. In this double-blind, randomized, multicenter clinical trial, 120 patients were equally divided into three groups. Patients in group A were advised to rinse their mouths with 10 mL of distilled water, group B with 0.2% chlorhexidine, and group C with *Triphala* mouthwash for 1 minute twice daily for two weeks. The plaque index (PI) and the gingival index (GI) were recorded on the first and the fifteenth day. Results: There was no significant difference when the efficacy of *Triphala* was compared with 0.2% chlorhexidine in hospitalized patients with periodontal disease. However, a statistically significant difference was observed in PI and GI when both group B and group C were compared with group A and also within groups B and C, after 15 days ($P<0.05$). The *Triphala* mouthwash (herbal) is an effective antiplaque agent like 0.2% chlorhexidine. It is significantly useful in reducing plaque accumulation and gingival inflammation, thereby controlling periodontal diseases in every patient. It is also cost effective, easily available, and well tolerable with no reported side effects.

47. Nandhini, T. and R. V. Geetha (2015). "**Comparison of the effectiveness of a commercially available herbal mouth rinse with chlorhexidine gluconate at the clinical and patient level.**" Journal of Pharmaceutical Sciences and Research **7**(8): 595-597.

Oral hygiene is the practice of keeping the mouth clean and healthy by brushing and flossing to prevent tooth decay and gum disease. The purpose of oral hygiene is to prevent the build up of plaque, the sticky film of bacteria and food that forms on the teeth. The removal of plaque is utmost important to control dental caries. The key to good oral health is hidden in nature. Natural herbs like neem, tulsi, pudina, clove oil, ajwain, ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***) and many more has been used since ages either as a whole single herb or as a combination against various oral health problems like bleeding gums, halitosis, mouth ulcers and preventing tooth decay. So the aim of the present study is to compare the effectiveness of a herbal mouth rinse with chlorhexidine gluconate mouth rinse at the clinical level in reducing Streptococcus mutans count. A randomized study was carried out on 30 patients who have dental caries. Out of which 15 subjects were given herbal mouthwash to rinse twice a day for five days. The other 15 were given 0.12% chlorhexidine mouthwash to rinse twice a day for five days. Saliva sample were collected prior to the use of mouth wash and after five days and Sreptococcus mutans count was done in terms of colony forming units per ml (CFU/ml). The results of the present study showed that herbal mouthwash can cause inhibition of bacterial growth.

48. Narayan, A. and C. Mendon (2012). "**Comparing the effect of different mouthrinses on de Novo plaque formation.**" Journal of Contemporary Dental Practice **13**(4): 460-463.

Several antiplaque agents are being available in the market in spite of vast development of modern medical science, satisfactory treatment of 'oral diseases' by newer drugs is not fully achieved, rather the chemical compounds has exposed the patients to it is different ill effects, therefore, there is interest to find out effective remedy of any disease by harmless herbal drugs thus the aim of this study was to compare plaque formation at 24 hours after the use of ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***), Hi ora, Chlorhexidine and colgate plax mouth washes. Methods: A controlled, randomized, double-blind, crossover clinical trial was designed. Thirty subjects underwent four consecutive experimental phases with four treatments: *Triphala*, Hi Ora, Chlorhexidine and colgate plax. On the day of study, the subjects discontinued all other oral hygiene habits and were randomly assigned for treatment with the experimental mouthwash. Each experimental phase was preceded by a 28- day washout period. Plaque formation was recorded after one undisturbed day. *Triphala*, Hi Ora and Chlorhexidine reduced de novo plaque formation to a greater extent than the colgate plax mouthwash ($p < 0.05$). *Triphala* and Hi Ora (with ***Triphala*** (*Emblica officinalis*, *Terminalia bellirica*, *Terminalia chebula*) and ***Trikatu*** (***Zingiber officinale, Piper longum, Piper nigrum***) among other ingredients) presents an anti-plaque efficacy similar to that of chlorhexdine, and was more effective at inhibiting plaque formation than the colgate plax mouth wash.

49. Nutalapati, C., C. U. Kumar, P. V. Kishan, K. Kiran Kishore and U. Pingali (2016). "**A randomized, double-blind, placebo-controlled, parallel group clinical study to evaluate the analgesic effect of aqueous extract *of Terminalia chebula*, a proprietary chromium complex, and their combination in subjects with joint discomfort.**" Asian Journal of Pharmaceutical and Clinical Research **9**(3): 264-269.

Objective: To evaluate the analgesic effect of an aqueous extract of ***Terminalia chebula*** (TCE), a proprietary chromium complex (PCC), and their combination in subjects with joint discomfort. Methods: A total of 100 patients with knee joint discomfort were randomized into five treatment groups - TCE 500 mg BID, TCE 500 mg BID+PCC 400 µg OD, PCC 400 µg OD alone, placebo, and TCE 250 mg BID, for 12 weeks in a double-blinded manner. Assessment of symptoms of knee joint pain and discomfort was done by modified Western Ontario and McMaster

Universities Arthritis Index (mWOMAC) and knee swelling index (KSI); visual analog scale (VAS) was used for subjective assessment of pain, stiffness, and disability. Statistical analysis was done with GraphPad Prism 6. Results: Absolute reduction in mWOMAC score in TCE 500 mg (19.82±8.35), TCE 500 mg+PCC 400 µg (13.10±5.69), PCC 400 µg (8.30±3.81), placebo (2.45±3.07), and TCE 250 mg (10.47±4.43), respectively, at the end of 12 weeks as compared to the baseline values. Absolute reduction in KSI in TCE 500 mg (28.95±16.82), TCE 500 mg+PCC 400 µg (19.14±9.50), PCC 400 µg (12.7±4.86), placebo (10.03±3.8), and TCE 250 mg (18.24±6.86), respectively, at the end of 12 weeks as compared to the baseline values ($p<0.001$). Similar results were seen VAS assessments for pain, stiffness, and disability. All the treatments were well tolerated. Conclusion: TCE and PCC reduce joint discomfort.

50. Palit, M., S. K. Hegde and S. S. Bhat (2016). "**Effectiveness of Mouthrinse formulated from Aqueous Extract of Terminalia chebula on Salivary Streptococcus mutans Count and pH among 8-to 12-year-old School Children of Karnataka: A Randomized Clinical Trial**." International Journal of Clinical Pediatric Dentistry **9**(4): 349–354.

The aim of the present study was to evaluate the anticar-iogenic efficacy of hot and cold aqueous extracts of ***Terminalia chebula*** against Streptococcus mutans as an oral rinse and also to discover the acceptability of the mouthwash in children. Sixty children between 8 and 12 years with high caries risk were selected. 10% concentration of hot and cold aqueous extracts were prepared. Children were randomly divided into extract and control group. Baseline salivary samples were taken, and the samples were re-collected at 10, 60, and 90 minutes interval after rinsing. Microbial and pH analysis were done. An acceptability questionnaire was filled. Tukey's multiple comparison test. The results show statistically significant difference in S. mutans counts at 10, 60, and 90 minutes interval when compared with negative control. However, when the hot and cold extracts were compared, there was no significant difference. Acceptability questionnaire showed 65 to 75% overall acceptability for both types of extract. Results of this study showed that both types of aqueous extract of T. chebula may be used as potential anticariogenic mouthwash with acceptable taste in children.

51. Pandya, M. G. and A. R. Dave (2014). "**A clinical study of Punarnava Mandura in the management of Pandu Roga in old age (geriatric anemia).**" AYU **35**(3): 252-260.

The incidence of anemia rises with age. The consequences of anemia are many and serious, affecting not only individual's health, but also the development of societies and countries. Pandu Roga can be effectively compared with anemia on the ground of its similar signs and symptoms. Aim of this study was to evaluate the Panduhara and Rasayana effect of Punarnava Mandura in the management of Pandu Roga in old age (geriatric anemia). The study was conducted in 50 clinically diagnosed patients of geriatric anemia. Patients were treated with Punarnava Mandura 2 tablets (250 mg each) twice in a day after lunch and dinner with Takra (butter milk) for 90 days. Among 50 registered patients, 40 patients had completed the treatment and 10 patients discontinued the treatment. Results were analyzed using Wilcoxon signed-rank test for subjective parameters and for assessment of objective parameters paired t-test was adopted. At the end of study, drug has shown beneficial effect in patients of anemia by providing highly significant result in chief complaints, associated symptoms, Kshaya of Dhatu and Agni Bala, Deha Bala and Sattwa Bala. It has also improved quality-of-life (QOL) of the patients. Moderate and mild improvement was observed in 30 and 70% of the patients respectively. Punarnava Mandura may work as Rasayana in geriatric anemia by providing highly significant results on clinical features of Pandu Roga, Dehabala, Agni Bala and Sattwa Bala and by improving QOL. of patients of geriatric anemia. According to Ayurvedic literature, most of the drugs in Punarnava Mandura that is ***Triphala***, Trikatu, Chitraka, Vidanga and Pippalimula are having appetizer, digestive and carminative properties. Hence it improves digestive power and ultimately absorption of nutrition and drug also.

52. Paranjpe, P., P. Patki and B. Patwardhan (1990). "**Ayurvedic treatment of obesity: A randomised double-blind, placebo-controlled clinical trial.**" Journal of Ethnopharmacology **29**(1): 1-11.

Seventy obese subjects were randomised into four groups. Ayurvedic drug including ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***) and ***Trikatu*** (***Zingiber officinale, Piper longum, Piper nigrum***) among many other herbs were given for three months while one group received a placebo. Physical, clinical and pathological investigations were carried out at regular intervals. A significant weight loss was observed in drug therapy groups when compared with the placebo. Body measurements such as skin fold thickness and hip and waist circumferences were significantly decreased. Decreases in serum cholesterol and triglyceride levels were observed. No side effects of any kind were observed during the treatment period.

53. Paranjpe, P. and P. H. Kulkarni (1995). "**Comparative efficacy of four Ayurvedic formulations in the treatment of acne vulgaris: A double-blind randomised placebo-controlled clinical evaluation.**" Journal of Ethnopharmacology **49**(3): 127-132.

Eighty-two patients with acne vulgaris were randomised into five groups. Four different Ayurvedic treatment schedules were given orally for 6 weeks, while one group received a placebo. Physical and clinical investigations were carried out at 2 week intervals. The drug also contains ***Triphala*** species (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***). A significant reduction in lesion count was observed in patients receiving Sunder Vati when compared with the placebo and the other Ayurvedic formulations, which failed to produce any significant difference from the pretreatment condition. The drug therapies were well tolerated.

54. Paranjpe, P., P. Patki and N. Joshi (2000). "**Efficacy of an indigenous formulation in patients with bleeding piles: A preliminary clinical study.**" Fitoterapia **71**(1): 41-45.

Piles (haemorrhoids) result in rectal bleeding. The results of the clinical assessment of a multiherbal indigenous formulation (*Berberis aristata*, *Holarrhena antidysenterica*, *Picrorrhiza kurroa*, *Mesua ferrea*, ***Terminalia chebula***, ***Terminalia bellirica***, ***Emblica officinalis***) on 22 patients with bleeding piles has been found very useful. The present study indicates that indigenous therapy was beneficial to patients with bleeding piles. The tried multiherbal formulation also reduced constipation, discharge and rectal bleeding.

55. Patel, M. V., S. Gupta and N. G. Patel (2011). "**Effects of Ayurvedic treatment on 100 patients of chronic renal failure (other than diabetic nephropathy)**." AYU **32**(4): 329-332.

Chronic renal failure (CRF) refers to an irreversible deterioration in renal function, which develops over a period of years. This initially manifests only as a biochemical abnormality. CRF is considered when glomerular filtration rate (GFR) falls below 30 ml/min. The conventional approach of management includes dialysis and renal transplantation, which are not affordable by Indian population mainly due to economic reasons. Therefore, exploration of a safe and alternative therapy is needed, which proves to be helpful in reducing the requirement of dialysis and in postponing the renal transplantation. A clinical study of 100 patients of CRF was conducted at OPD and IPD of PD Patel Ayurved Hospital, Nadiad. They were given Niruha basti of Punarnavadi kvatha daily with oral medicaments including Goksuradi guggulu, Rasayana churna, and Varunadi kvatha for 1 month period. Treatment contained Goksuradi guggulu (compound Ayurvedic preparation: Gokshura+Guggulu+***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***)+***Trikatu*** (***Zingiber officinale, Piper longum, Piper nigrum***)+Musta) 1 g three times a day. Rasayan churna Gokshura + Amalaki (***Emblica officinalis***) + Guduchi (***Tinospora cordifolia***) in equal quantities) 3 g two times a day. Varunadi kvath (ingredients: Varuna tvak + Bilva moola + Apamarga + Chitrak moola + Arani + Shigru + Bruhati + Kirattikta + Karanja + Shatavari) 10 g two times/day. Niruha basti of Punarnavadi kvatha daily. The patients of CRF, having diabetic nephropathy as a cause, were excluded since a separate study for diabetic nephropathy is being conducted. Results were analyzed statistically

using the "t " test. The symptoms and signs, serum creatinine, blood urea, urine albumin level were reduced, which were found to be statistically highly significant on "t " test. With the help of clinical observations and the discussion made, it may be concluded that 86% patients of CRF have hypertension as a basic underlying cause. The result obtained may be attributed to the disease modifying effect of trial therapy by means of its Rasayana and anti Vata-Kapha properties. The trial therapy is an ideal drug as a safe and effective alternative in case of CRF. Serum creatinine, blood urea and albuminuria reduced 20.71%, 32.15% and 36.70%, respectively. Hemoglobin level and urine output increased by 4.38% and 56.54%, respectively. They were statistically highly significant. All the patients have shown more than 50% relief in all the signs and symptoms. In a difficult condition where conventional treatments are beyond the financial capacities of a common man of the country, this therapy can be hopeful and promising.

56. Phetkate, P., T. Kummalue, Y. U-Pratya and S. Kietinun (2012). "**Significant increase in cytotoxic T lymphocytes and natural killer cells by *Triphala*: A clinical phase I study.**" Evidence-based Complementary and Alternative Medicine **2012**. Article ID 239856.

Searching for drugs or herbal formulations to improve the immunity of HIV/AIDS positive people is an important issue for researchers in this field. ***Triphala*** (note: ***Triphala* is claimed by the authors in this article as a Thai herbal formulation!**), is reported to have immunomodulatory effects in mice. However, it has not yet been investigated for immunostimulatory and side effects in healthy human volunteers. Objective here was to evaluate the immunostimulatory and side effects of ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***) in a clinical phase I study. All volunteers took ***Triphala***, 3 capsules per day for 2 weeks. Complete physical examination, routine laboratory analysis, and immunological studies were performed before ingestion and after initial meeting for 4 consecutive weeks. It was found that ***Triphala*** demonstrated significant immunostimulatory effects on cytotoxic T cells (CD3 -CD8+) and natural killer cells (CD16+CD56 +). Both of them increased significantly when compared with those of the control samples. However, no significant change in cytokine secretion was detected. All volunteers were healthy and showed no adverse effects throughout the duration of the study. ***Triphala*** has significant immunostimulatory effects on cellular immune response, especially cytotoxic T cells and natural killer cells. Increases in the absolute number of these cells may provide a novel adjuvant therapy for HIV/AIDS positive people in terms of immunological improvement.

57. Pradeep, A. R., D. K. Suke, S. S. Martande, S. P. Singh, K. Nagpal and S. B. Naik (2016). "**Triphala, a new herbal mouthwash for the treatment of gingivitis: A randomized controlled clinical trial**." Journal of Periodontology **87**(11): 1352-1359.

Background: An antiplaque agent with minimal side effects that can be used as an effective adjunct to mechanical plaque control is needed. The current study is designed to evaluate efficacy of ***triphala*** (TRP) mouthwash in reduction of plaque and gingivitis. Methods: Ninety individuals with chronic generalized gingivitis were randomly assigned to three groups: 1) group I, placebo mouthwash; 2) group II, TRP mouthwash; and 3) group III, chlorhexidine (CHX) mouthwash. All individuals were instructed to rinse with their respective mouthwash twice daily. 1) Plaque index (PI); 2) gingival index (GI); 3) oral hygiene index-simplified (OHI-S); and 4) microbiologic colony counts were recorded at baseline and at 7, 30, and 60 days. Results: All three groups showed gradual reduction in PI, GI, and OHI-S levels from baseline to 7, 30, and 60 days. There was also significant reduction in microbial counts in all groups at all time intervals except in group I. A significant difference was noticed with respect to reduction in PI, GI, OHI-S, and microbiologic counts in group I compared with groups II and III. However, no significant differences were found between groups II and III for any parameters at any time intervals. Conclusions: TRP mouthwash was found to decrease inflammatory parameters from baseline to follow-up intervals. Because improvement in gingivitis was comparable with that of CHX

mouthwash, TRP mouthwash can be considered a potential therapeutic agent in the treatment of gingivitis.

58. Rani, P. (2014). "**A clinical study to evaluate the role of holistic Ayurveda treatment in Pramehaja Timira wsr background diabetic retinopathy.**" Asian Resonance **3**(3): 100-107.

Diabetic Retinopathy (DR) is a long term complication of Diabetes mellitus. DR is covered under Prameja Timira in Ayurvedic concepts. Taking this concept into consideration an Open randomized control study was conducted with an aim to study DR and Pramehaja Timira conceptually and to evaluate the clinical efficacy of the holistic Ayurvedic approach in Background Diabetic Retinopathy/BDR. Total 30 patients of BDR were divided randomly into two groups, Group A (Treatment group) and Group B (Control group), each having 15 patients (30 eyes). In Group A, classical Virechana karma was adopted followed by Takra shirodhara (21 days), Pratimarsha nasya (30 days) and Rasayana yoga (30 days) simultaneously. Drugs included Deepana Pachana – Trikatu [4] (three-seven days), Snehpana – Triphala Ghrita (three-seven days), Vashpa Sveda and Bala Taila Abhyanga - three days, Virechana- Virechana Yoga containing ***Triphala***+ Trivrita+ Katuki (two:one:one). Rasayana Yoga contained equal amount of Amalaki (Emblica officinalis), Musta, Haridra and Guduchi (Tinospora cordifolia), orally five grams twice, two hours before meal with Madhu and Ghrita for 30 days. In Group B, all the patients were kept under observation for period of 60 days. All patients in both groups continued anti hyperglycemic treatment as prescribed by their physician as well as anti-hypertensive treatment (those suffering from it). The results were drawn after analyzing statistically by paired and unpaired t tests. In Group A, out of 30 eyes, 15 (50.00%) eyes showed mild improvement, 14 (46.67%) eyes showed moderate improvement and one eye (03.33%) was unaffected. No eye showed marked improvement or progression after treatment. In Group B, out of 30 eyes, 25(83.33%) eyes showed mild improvement, three (10%) eyes showed moderate improvement, two (6.67%) eyes showed progression of the disease. No eye got marked improvement. Holistic Ayurvedic treatment was more helpful in relieving signs and symptoms of BDR patients as well as better control of FBS, PPBS and HbA1C.

59. Raina, A., A. Bhardwaj and A. Sharma (2017). "**Pain management after kshar-sutra ligation of haemorrhoids with herbomineral preparation and standard NSAID: A contrastive study**." AYUSHDHARA **3**(3): 702-706.

The disease haemorrhoids is an Ano-rectal disorder and is as old as mankind. A large population of the world population is troubled with this disease which is due to inconsistency of the human diet and social obligations demanded by civilization. The management of 3rd degree haemorrhoids needs mainly a surgical approach. The Kshara-sutra ligation method of haemorrhoids is done by Ayurvedic surgeons but facing hardships in post ligation pain management. A complete Ayurvedic postoperative pain management is the need of every Ayurvedic surgeon. This study was carried out with an attempt to find an effective and safe Ayurvedic postoperative pain management and for this, 30 Patients who were undergone Kshara sutra ligation of haemorrhoids were selected from the from the IPD of Post Graduate of Department Shalya Tantra, Jammu Institute Of Ayurveda And Research Hospital, Nardani, Jammu. Selected patients were randomly divided into two groups each of 15 patients. For pain relief, the patients in Group A were administered with Diclofenac sodium, which is an established NSAID, in the dose of 50mg TDS orally where as the patients in Group B were administered with **Triphala** Guggulu and Gandhaka Rasayana in the dose of 450 mg TDS and 250 mg TDS orally respectively. Although satisfactory result obtained on all parameters with Triphala Guggulu and Gandhaka Rasayana but Diclofenac sodium is found statistically more significant.

60. Rawal, R. C., P. Gandhi, T. B. Singh Prof and K. H. H. V. S. S. Narasimha Murthy (2013). "**Clinical evaluation of hairbac tablet and oil in the management of diffuse hair loss: An open clinical study.**" International Journal of Research in Ayurveda and Pharmacy **4**(4): 564-569.

Hair is an important component of the body derived from ectoderm of skin. Keratin is the main component of hair fibers. Hair has great psycho-social significance for persons. The average growth rate in a normal scalp is 0.41 mm per day but lower growth rate is observed among aged persons and chronic disease persons. Hair loss is a most common problem among men and women of all age groups and it is a socially and psychologically distressing also. Its severity varies from a small bare patch to a more diffuse and obvious pattern. Diffuse hair loss may occur at any age and gender. It affects the whole scalp. Management of hair fall is extremely complex. Treatments for the various forms are available but alopecia has limited success. As a general rule, it is easier to maintain remaining hair than it is to re-grow; however, the success rate is very less with unwanted adverse effects. There are claims that poly herbal formulations are giving promising results. So, a poly herbal formulation 'Hairbac' tablet and oil, is evaluated for its safety and efficacy in diffuse hair loss. The subjective parameters used for assessment were Hair Texture, Hair Density/cm sq area and Hair Loss. The beneficial effects of Hairbac Tablets and Oil assessed in the context of hair texture, density /1cm2 and hair loss among females suffering with diffuse hair fall showed highly significant improvement without any adverse effects assessed by the respondents. Drugs contained in tablet and oil include *Bacopa monnieri* extract; *Eclipta prostrata* extract; ***Emblica officinalis*** extract; hairbac; herbaceous agent; *Indigofera tinctoria* extract; *Nardostachy jatamansi* extract; oil; *Phyllanthus niruri* extract; plant extract; *Santalum album* extract; *Spirulina* extract; unclassified drug

61. Sawant, D. P., G. R. Parlikar and S. V. Binorkar (2013). "**Efficacy of Triphala Ghrita Netratarpan in computer vision syndrome.**" International Journal of Research in Ayurveda and Pharmacy **4**(2): 244-248.

In present era, the computerization in a country is necessary for the progress. It seems that the work at computer is very intensive and most tiring. Computer Vision Syndrome (CVS) is the complex condition of eye and vision problems that are related to near work which are experienced during or related to computer use. Traditional medicine has been practiced for many centuries in many parts of the world. The present study was undertaken to evaluate the effect of **Triphala** Ghrita Tarpan herbal compound preparation as per the classics in 30 patients suffering from CVS in trial group for 7 days in three consecutive months. The duration of Tarpana was 15-20 minutes. While the control group also included with 30 patients and were advised with certain eye exercise. The results in trial group were satisfactory and Tarpana was found to be effective in treating all the signs and symptoms of CVS which was supported by the statistical analysis (P<0.001).

62. Saxena, S., N. Lakshminarayan, S. Gudli and M. Kumar (2017). "**Anti bacterial efficacy of terminalia chebula, Terminalia Bellirica, Embilica officinalis and triphala on salivary Streptococcus mutans count – A linear randomized cross over trial**." Journal of Clinical and Diagnostic Research **11**(2): ZC47-ZC51.

Introduction: From the oral health perspective, it is well established that microorganisms have an important role in caries aetiology. From the dawn of civilization, herbal plants have served an array of roles. ***Triphala*** a tradtional herbal Ayurvedic formula consists of three native fruits of india including ***Terminalia Chebula* (*T. chebula*)**, ***Terminalia Bellirica* (*T. bellirica*)** and ***Embilica Officinalis* (*E. officinalis*)**. As per Ayurvedic Formulary of India (AFI) Triphala is prepared by combining a 1:1:1 mixture of ground dry fruits called myrobalans. Till date, an inadequate number of clinical researches on herb based mouth rinses have been reported in Asia, especially in India and other Southeast Asian countries (where these products are most accepted and widely used). The present study was planned to assess the effectiveness of Triphala with its three constituents. Aim: The objective of this study was to determine the effect

of Triphala, T. chebula, T. bellirica and E. officinalis aqueous extract rinses separately on Streptococcus mutans count at various time intervals. Materials and Methods: This is a double-blind, linear cross over, within group experimental trial conducted among subjects visiting the Department of Public Health Dentistry aged 15 to 40 years. In this design, subjects received all of the treatments sequentially in time. The independent variables to be assessed in this study were all the four interventions of herbal preparations used and the dependent variable assessed is anti bacterial efficacy. Each subject receives two or more different treatments. All the subjects were exposed to all four interventions: 1) T. chebula; 2) T. bellirica; 3) E. officinalis; and 4) Triphala and were provided 15 ml of the freshly prepared 10% rinse. The subjects were instructed not to eat or drink between salivary samples collection. Post rinse unstimulated salivary samples were collected at five minutes and 60 minutes intervals. All the salivary samples were transferred immediately to microbiological laboratory in sterile containers within one hour for microbiological analysis. Results: The mean Colony Forming Units (CFUs) of S. mutans with Triphala when compared to other three intervention was significantly reduced at 5 minutes and 60 minutes (p=0.001). E. officinalis showed least reduction of mean CFUs when compared to other three groups. Conclusion: It can be concluded that all four rinses were effective in reducing S. mutans CFUs, but 10% Triphala has greater efficacy than its other constituents.

63. Shailaja, U., N. Rao Prasanna, G. R. Arun Raj and V. Mallannavar (2013). "**Effect of Kumarabharana rasa on chronic tonsillitis in children: A pilot clinical study.**" International Journal of Research in Ayurveda and Pharmacy **4**(2): 153-157.

Objective of the study was to assess the effect of Kumarabharana Rasa in the management of chronic tonsillitis (Tundikeri) in children. This study was pilot clinical study with single arm with pre and post test design at outpatient level in a tertiary Ayurveda hospital attached to teaching institute located in district headquarters in Southern India. 16 patients of chronic tonsillitis satisfying diagnostic criteria and age 5-10 years were selected from outpatient department of Kaumarbhritya, Shri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan. Patients were treated with Kumarabharana rasa (tablet form) in the dose of 500mg once daily for 30 days. The percentage of relief in various assessment criteria were observed which are Kathina shotha (enlargement of tonsils) (43.20%), Ragatwa (hyperemia) (48.83%), Galoparodha (dysphagia) (47.48%), Mukha daurgandhya (halitosis) (49.68%), Lasikagranthi vriddhi (enlargement of lymph nodes) (37.72%) and Jwara (improvement in fever) (85.71%). Kumarabharana Rasa is effective in reducing the signs and symptoms of chronic tonsillitis. Various constituents of drug include Acorus calamus extract; Bacopa monnieri extract; calcium oxide; ***Emblica officinalis*** extract; ginger extract; Glycyrrhiza glabra extract; gold; kumarabharana rasa; natural product; Ocimum tenuiflorum extract; Piper longum extract; plant extract; respiratory tract agent; silver; ***Terminalia chebula*** extract; Tinospora cordifolia extract; unclassified drug; Withania somnifera extract.

64. Sharma, B. and D. K. Goyal (2015). "**A comparative clinical evaluation of the efficacy of madhumeha nashini gutika & darvyadi kwath in madhumeha wsr to diabetes mellitus.**" International Journal of Ayurveda and Pharma Research **3**(8): 11-18.

As per WHO report, currently half a billion people (12% of the world's population) are considered obese. As obesity is the one of the root cause of the disease. Observing the current status of prevalence and morbidity of the disease proper medication for the disease is mandatory. In the present study, Madhumeha Nashini Gutika a herbomineral preparation and Darvyadi Kwath (both mentioned in Ayurvedic texts) were selected for clinical trial. The study comprised of a series of 60 patients of Madhumeha. The patients were selected from OPD and IPD of Kayachikitsa of Rishikul Government Ayurvedic P.G. College & Hospital. After evaluating the total effect of therapies it was observed that the Madhumeha Nashinh Gutika & Darvyadi Kwath (Combined therapy) provided better relief to the patients of Madhumeha in comparison

to single group therapy. Darvyadi Kwath' consisting Devdaru, Daruhridra, ***Triphala*** and Musta. These drugs basically are Kashaya and Tikta Rasa pradhan, Ushna Veerya and Laghu Ruksha Guna, this formulation helps in eliminating vitiated kapha. It also corrects the vitiated both Medas and Kapha being the main entity of the Samprapti, thus by breaking the Samprapti (correcting the vitiation of Medas and Kapha) treats the disease. As the drug is Ushna it also increased improving the Dhatvagni, (as Ayurveda believes that the disease is Amajanya).

65. Sharma, L. and I. Sharma (2009). "**A comparative drug trial on Santarpanottha Madhumeha Vishesha (Syndrome X).**" AYU **30**(1): 22-28.

Syndrome-X has emerged as an area of special interest to medical faculty as it houses worst lifestyle pathologies in one patient. There being unknown common ground to Diabetes Mellitus, Hypertension, Obesity & dyslipidemia, the nomenclature adopted is Syndrome-X. As these diseases are observed to be led by Diabetes Mellitus, the other names of the syndrome are Metabolic Syndrome & Insulin resistant syndrome. This is why the Ayurvedic name attributed is 'Santarpanottha Madhumeha Vishesha'. The present study was aimed at observing & evaluating the common Nidana along with a comparative clinical study of two herbo-mineral compounds. 100 diagnosed patients of Syndrome-X were selected and randomly divided in two groups of fifty patients each; Group-A receiving Compound - A, Whereas Group-B receiving Compound - A with Medohara (Navak) Guggulu respectively. The vehicle for both the groups was Dashamoola decoction in a dose of 40 ml twice a day for 45 days. It was observed that most patients in group -B had significant improvement in Shrama, Prabhoot mootrata, Daurbalya, Vibandha, Kanthatalu shosha, Pipasadhikya & Sada. Compound A contained ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***) among other drugs, and Medohara (Navak) Guggulu contained ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***), ***Trikatu*** (***Zingiber officinale, Piper longum, Piper nigrum***), *Trimada* & Guggulu.

66. Sharma, M. R., C. S. Mehta, D. J. Shukla, K. B. Patel, M. V. Patel and S. N. Gupta (2013). "**Multimodal Ayurvedic management for Sandhigatavata (Osteoarthritis of knee joints).**" AYU **34**(1): 49-55.

Vata is the governing factor in the maintenance of equilibrium in the universe as well as in the body. As age advances, the influence of Vata Dosha progresses, resulting in the process of gradual degeneration of the body. Sandhigatavata (osteoarthritis) is one of the consequences of this process, which is common in the elderly people. This is one of the major causes of chronic disability, affecting the quality of life. Prevalence of osteoarthritis in India is more among menopausal women. This study has been conducted to evaluate the efficacy of Ayurvedic multimodal management in Sandhigatavata and to provide better options to Non-Steroidal Anti-Inflammatory Drugs (NSAIDs). In present clinical trial, 50 patients of Sandhigatavata have been registered and have been given Snehana, Svedana, Mriduvirechana, Matrabasti, and Jalaukavacharana, along with oral medications like Yogaraja Guggulu and Ashvagandha Churna. Yogaraja Guggulu contains many herbs including ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***) and ***Trikatu Zingiber officinale, Piper longum, Piper nigrum***). Ashvagandha Churna (root powder of *Withania somnnifera* Dunal.) 3 g with warm milk was given in morning and evening before meals. This multimodal therapy is being used in P.D. Patel Ayurved Hospital, Nadiad, since years, providing good relief to patients with Sandhigatavata. The results have been analyzed statistically by using the Student paired't' test. The therapy showed highly significant ($P < 0.001$) beneficial effect on the clinical features of Sandhigatavata. On overall effect of therapy, 4% of the patients were relieved completely, while 24% have shown marked improvement, 50% moderate improvement, and 22% mild improvement. Results of follow-up showed that marked improvement decreased, but moderate improvement was steady. Continuing the study on a larger number of patients, with inclusion of more objective parameters to get better conclusions is suggested at the end of the study.

67. Sharma, R. K. and P. S. Patki (2010). "**Double-blind, placebo-controlled clinical evaluation of an Ayurvedic formulation (GlucoCare capsules) in non-insulin dependent diabetes mellitus.**" Journal of Ayurveda and Integrative Medicine **1**(1): 45-51.

Diabetes mellitus describes a metabolic disorder of multiple etiologies characterized by insulin resistance, relative insulin deficiency and hyperglycemia with disturbances of carbohydrate, fat and protein metabolism. The goal for treatment of diabetes is to prevent its acute manifestations and long-term microvascular and macrovascular complications. The present study was conducted to evaluate the efficacy and safety of an Ayurvedic formulation (GlucoCare Capsules) in non-insulin dependent diabetes mellitus. Fifty NIDDM patients of pitta-kapha prakriti attending the outpatient department of the Government Ayurvedic Medical College, Guwahati, Assam, India were included in the study, and randomly divided into 2 groups, GlucoCare and placebo. The drug contains ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***), ***Trikatu Zingiber officinale, Piper longum, Piper nigrum***) and ***Tinospora cordifolia*** among others. All received either GlucoCare or placebo in a dose of 2 capsules twice daily, before meals for 3 months. All 50 patients completed the study-no drop outs, withdrawals or patients lost to follow up. The GlucoCare group showed significant improvement in symptoms from the 2nd month till the end of the study. GlucoCare was well tolerated by all patients throughout the treatment period with no evidence of adverse effects. The study indicates clinical efficacy of GlucoCare Capsules in the management of NIDDM in those belonging to pitta-kapha prakriti. The formulation is well tolerated and appears safe in the dosage used.

68. Sharma, V. and A. K. Chaudhary (2015). "**Pharmaceutical standardization of a novel anti leukemic Ayurvedic herbomineral formulation.**" International Journal of Pharmaceutical & Biological Archive **6**(1): 49 - 58.

The aim of this pharmaceutical study was to develop standard manufacturing process of Leukchem 14, a novel herbo-mineral formulation, which was designed for the treatment of Leukemia. The drug consists in specific proportions of dried powders of Ashwagandha (***Withania somnifera*** Dunal.) root, Bilwa (*Aegle marmelos* Carr.) fruit pulp, Guduchi (***Tinospora cordifolia*** (Willd) Miers.) stem, Haridra (*Curcuma longa* Linn.) rhizome, Kanchanar (*Bauhinia variegata* Blume) stem bark and ***Triphala*** (***Terminalia bellirica***, ***Terminalia chebula***, ***Emblica officinalis***), and mineral drugs viz. Samaguna Kajjali (black sulphide of purified Mercury) and Shuddha Manahshila (purified Realgar). By adopting the principles of Kharaliya Rasayana, the homogenous mixture was prepared with these drugs, which was further levigated with fresh cow urine and decoction of Manjishtha (*Rubia cordifolia* Linn.) root respectively each three times in three batches. During the procedures of Shodhana and Bhavana, there were various physicochemical changes were observed. In first step, 317.82, 319.25, and 318.0 g of weight with the Bhavana of Gomutra was obtained from 306.50 g of basic homogenous mixture of herbal Churna, Kajjali and Shuddha Manahshila in I, II, and III batches respectively. In second step, 244.79, 241.72, and 243.00 g of Leukchem 14 with the Bhavana of Manjishtha Kwatha was obtained from 200 g of Gomutra Bhavita materials in I, II, and III batches respectively. The percentage increase in weight was observed after levigation with both the media progressively, 3.87 % by cow urine and 21.59% by Manjishtha Kwatha. At the end of Pharmaceutical study, dark brown coffee coloured powder was obtained.

69. Singh, N., S. Mahajan, S. K. Subramani, D. Yadav, L. Singh and G. Prasad (2015). "***Triphala*** **improves glucose homeostasis by alleviating atherogenic lipids and oxidative stress in human Type 2 diabetes mellitus.**" International Journal of Ayurvedic Medicine **6**(3): 212-219.

'***Triphala***' constituting equal parts of three medicinal dried plant fruits ***Emblica officinalis*** Gaertn., ***Terminalia chebula*** Retz. and ***Terminalia bellirica*** Gaertn. is an antioxidant rich Ayurvedic formulation. The present study assessed therapeutic as well as protective effects of ***Triphala*** on human subjects with Type 2 diabetes mellitus (T2DM) and Impaired glucose

tolerance (IGT). ***Triphala*** at a dose of 5 gms BD was administered to two cohorts viz., IGT, N= 20 and T2DM, N=30 consecutively for a period of 12 months. The therapeutic efficacy was assessed quarterly by monitoring blood glucose and lipid levels; the protective effect by monitoring antioxidants level quarterly and DNA damage annually. Toxicity if any, to liver and kidney due to long term administration was assessed quarterly in both cohorts. Continuous '***Triphala***' therapy for 12 months significantly reduced blood glucose ($p \leq 0.001$) and li-pid levels ($p \leq 0.05$) in both the cohorts. ***Triphala*** resisted oxidative stress generated during the course of hypergly-cemia by significantly increasing the activity of super oxide dismutase and Catalase ($p \leq 0.001$) and the level of re-duced glutathione ($p \leq 0.001$). Protective effect on DNA was accessed through significant reduction in the comet tail length ($p \leq 0.001$). In conclusions, '***Triphala***' ameliorated not only the oxidative stress but also normalized glucose and lipid homeosta-sis in subjects with impaired glucose and T2DM.

70. Srinagesh, J. and K. Pushpanjali (2011). "**Assessment of antibacterial efficacy of *Triphala* against mutans streptococci: a randomised control trial.**" Oral health & preventive dentistry **9**(4): 387-393.

Triphala (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***) is an ayurvedic preparation with known antimicrobial action. This study was carried out to assess the antibacterial efficacy of ***Triphala*** against salivary mutans streptococci in comparison with the 'gold standard' chlorhexidine. A double blind randomised control trial was conducted among 57 volunteers who were assessed to be in the high caries risk category. They were randomly allocated into three study groups: 1) 15 ml of 6% ***Triphala*** mouthwash; 2) 15 ml of 0.2% chlorhexidine (active control); 3) no mouthwash (passive control). Mouthwashes were given twice a day for 15 days. Unstimulated saliva samples were collected at baseline and at 15 and 45 days. Mutans streptococci (MS) were cultured on MSB agar and colony counts obtained. The α error was fixed at 5%. ANOVA and post-hoc LSD tests were performed using SPSS version 14. After using mouthwash for 15 days, an 83% and 80% reduction and at 45 days a 67% and 65% reduction in salivary MS colony count was observed in the ***Triphala*** and chlorhexidine groups, respectively ($P = 0.0001$). The control group showed an increase of 3% in MS colony count at 15 days and a reduction of 7% at 45 days. ($P = 0.116$). The antimicrobial action of ***Triphala*** against mutans streptococci closely parallels that of chlorhexidine. It does not have the side effects commonly associated with chlorhexidine and is cost effective.

71. Srivastava, A. K. (2015). "**Role of Amrita Guggulu in the management of Vata-rakta - A Clinical Trial**" International Journal of Pharmaceutical & Biological Archive **5**(4): 45 - 51.

In the present revolutionary era the life of a person is hectic and materialistic. For the survival of fitness, the men expected to remain healthy physically as well as mentally. It is quite difficult due to the various obstacles which are experienced by men during his routine life. The disease Vata-rakta is one of them. It is a burning problem of present era. It has attracted the attention of world's scientists working on the problem, not due to its fatality but due to its remote complications and sequels. If the chronic condition is not treated properly the deformity of joints and cartilages cripples a person throughout his life. Vata-rakta is an ailment where both Vata and Rakta are responsible to lead a complex effect on the joint and produces Vata-rakta. Vata-rakta is a disease of joints and its clinical onset is from great toe which later spreads over other joints of the body. In Chakradutta, Vatavyadhi Rogaadhikaar, Chapter 23, Amrita Guggulu is described. Amrita Guggulu Pratham described therein is taken here for the treatment of Vatarakta. The drug consists mainly of ingredients like Guggulu (*Commiphora mukul*), ***Triphala*** (***Terminalia chebula*** Retz, ***Terminalia bellirica***, ***Emblica officinalis***), Guduchi (*Tinospora cordifolia*). This is a single-blind clinical study with a pre-test and post-test design, wherein a minimum of 30 patients of both sex, suffering from Vata-rakta, in an age limit of 20 to 60 years, were selected randomly and given Amrita Guggulu with an Anupaana of Amritaadi Kashaya72 ml with each dose. The therapeutic effect of the treatment was assessed based on specific subjective and objective parameters. Statistically significant improvement was observed in all

the criterion of assessment. The use of Amrita Guggulu as Shamana Aushadha was a perfect selection in the management of Vata-rakta. As a preliminary study, it has paved the further scope of study with bigger sample size in management of Vata-rakta.

72. Sujata, N., S. Kumar, G. D. Gupta and N. Rai (2008). "**Hepato-protective effect of *Triphala* in infective hepatitis (Hepatitis B): A clinical and an experimental study.**" AYU (An international quarterly journal of research in Ayurveda) **29**(3): 176.

Liver is the hub of wheel of life. Liver is one of the extensively explored areas in Modern Medicine. Among the various diseases affecting it, Hepatitis-B virus infection is the most common cause. The clinical symptoms of Hepatitis-B are similar with those described under Kamala Roga in Ayurveda. Hepatitis-B, because of its potential to cause life-threatening complications like Cirrhosis, Ascites, and Hepatocellular Carcinoma, has been kept on the top of National Agenda in Public Health Administration. Hepatitis-B virus infects more than 2 billion people worldwide, out of which 360 millions are chronic carriers annually1 . It is the 10th leading cause of mortality and Hepatocellular Carcinoma is the 5th most common cancer in the world which accounts for 1.2 millions deaths globally every year2 . Western Medicine, despite its enormous success does not offer any promising cure and here the role of traditional systems of medicine cannot be overlooked. Ayurveda, the ancient science of life is enriched with ample amount of herbal drugs, which are tested and trusted and subjected to thorough clinical and experimental studies. The drugs have been proved safe and highly efficacious with almost no side effects and have been included in Pub-Med India and National Index of Medicine. A trial has been conducted as part of research program to evaluate the role and efficacy of ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***) in the management of Hepatitis-B. Total 44 cases of Hepatitis-B were registered, out of which 38 cases completed the treatment schedule .The result of treatment were found satisfactory in terms of clinical and biochemical parameters. Moreover, Experimental Study has also been carried to substantiate the above clinical findings and also evaluate the mode of action of trial drug.

73. Tandon, S., K. Gupta, S. Rao and K. Malagi (2010). "**Effect of *Triphala* mouthwash on the caries status.**" International Journal of Ayurveda Research **1**(2): 93–99.

Nearly 60–70% of the child Indian population suffers from dental caries. Mouth rinsing is the most cost effective method of preventing dental caries. '***Triphala***' (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***) has been a classic Ayurveda remedy, probably the best known among all Ayurvedic compounds. This study was conducted on 1501 students in the age group of 8-12 years with the aim of determining the effect of ***Triphala*** mouthwash on prevention of dental caries (manifest caries) as well as incipient carious lesions, and also comparing the effect of ***Triphala*** and chlorhexidine mouthwashes. The incipient caries was recorded at 3, 6, 9 months intervals and manifest caries at 9 months interval. No significant increase in the DMFS scores was found at the end of 9 months. Also, there was no significant increase in the incipient caries score towards the conclusion of the study. It was concluded that there was no significant difference between the ***Triphala*** and the chlorhexidine mouthwashes.

74. Tripathi, R. K., S. S. Bolegave, P. A. Shetty, D. A. Uchil, N. N. Rege, M. B. Chawda and S. A. Rege (2015). "**Efficacy and safety of a polyherbal formulation in hemorrhoids**." Journal of Ayurveda and Integrative Medicine **6**(4): 225-232.

The medical management of hemorrhoids should include an integrated approach. This integrated approach can be achieved by polyherbal formulations containing anti-inflammatory, styptics, analgesics, and laxative effect which reduce inflammation, pain, and bleeding, and increase gastro-intestinal motility and soften stools. One such polyherbal kit is Arshkeyt™, a 7 day kit, which consists of oral tablets and powder along with topical cream. The key ingredients of "Arshkeyt™ Tablet" are Arshoghni vati, ***Triphala*** guggul, Amorphallus campanulatus (Surana), and Melia azedarach (Mahanimba) which have styptic, analgesic, anti-inflammatory,

antimicrobial, and wound healing properties. Objective: Efficacy and safety of Arshkeyt™, a 7 day kit, a marketed polyherbal formulation was evaluated in comparison with conventional therapy practiced in surgery outpatient departments. Materials and Methods: Patients (n = 90) with hemorrhoids were randomly allocated to receive either Arshkeyt™ or standard therapy (combination of oral Isabgul powder and 2% lidocaine gel) for 14 days. Assessment on the basis of rectal symptoms and proctoscopic examination was done on day 0, 7, and 14 to derive a composite score which ranged from 0 to 25 by a blinded evaluator. The primary endpoint was number of patients achieving composite score 0 at the end of therapy (day 14). Inter-group analysis was done using Chi-square test. Results: On day 14, the composite score of 0 was achieved in 15 patients of Arshkeyt™ group versus 6 patients receiving standard therapy. The symptoms and signs which showed significant improvement in Arshkeyt™ group compared to standard treatment group were the tenesmus (visual analog score) score (P = 0.047), anal sphincter spasm (P = 0.0495) and a decrease in the grade of hemorrhoids (P = 0.0205) on day 14. Arshkeyt™ was also more beneficial in case of bleeding hemorrhoids as compared to nonbleeding hemorrhoids (P < 0.05). The incidence of adverse drug reactions in both groups was comparable and no patient required any treatment for the same. Conclusion: Arshkeyt™, a 7 day kit, was effective in the treatment of hemorrhoids and had a good safety profile.

75. Usharani, P., C. Nutalapati, V. K. Pokuri, C. U. Kumar and G. Taduri (2016). "**A randomized, double-blind, placebo-, and positive-controlled clinical pilot study to evaluate the efficacy and tolerability of standardized aqueous extracts of *Terminalia chebula* and *Terminalia bellerica* in subjects with hyperuricemia.**" Clinical Pharmacology: Advances and Applications **8**: 51-59.

Objectives: To evaluate the efficacy and tolerability of standardized aqueous extracts of ***Terminalia chebula*** and ***Terminalia bellerica*** versus febuxostat and placebo on reduction in serum uric acid levels in subjects with hyperuricemia. Materials and methods: A total of 110 eligible subjects with hyperuricemia were enrolled and randomized to either of the five treatment groups – T. chebula 500 mg twice a day (BID), T. bellerica 250 mg BID, T. bellerica 500 mg BID, placebo BID, and febuxostat 40 mg once daily plus an identical placebo – for a duration of 24 weeks. Serum uric acid levels were measured at baseline and at the end of 4, 8, 12, 16, 20, and 24 weeks. Statistical analysis was done using GraphPad Prism Software 4. Results and interpretation: All active treatment groups showed a reduction in serum uric acid levels compared to baseline and placebo. Significant reduction in mean serum uric acid levels started as early as 4 weeks following treatment, compared to baseline, with T. bellerica (500 and 250 mg), febuxostat (P<0.001), and T. chebula 500 mg (P<0.01); an increase in serum uric acid levels was seen with placebo (P<0.05). The serum uric acid levels became steady after 16 weeks of treatment and remained the same until the end of 24 weeks. The reduction of serum uric acid levels in the T. bellerica 500 mg group was nearly twice that of the T. chebula 500 mg group as well as T. bellerica 250 mg group at all time points. T. bellerica 500 mg reduced serum uric acid levels from 8.07±0.87 to 5.78±0.25 compared to febuxostat, which reduced serum uric acid levels from 8.53±0.97 to 4.28±0.67 (P<0.001) at the end of 24 weeks. The efficacy of T. bellerica appeared to be dose dependent. All the formulations were well tolerated. Conclusion: T. bellerica has the potential for treating hyperuricemia as it was devoid of any serious adverse effects in the present study. Further studies are needed to confirm this potential.

76. Umarji, M. P. and G. S. Jyothi (2013). "**Evaluation of efficacy and safety of a herbal formulation EveCare in the management of menstrual irregularities: Meta-analysis of 8 clinical studies.**" International Journal of Science and Research **4**(6): 475-481.

EveCare capsule is a polyherbal formulation that comprises extracts of *Saraca indica*, *Boerhaavia diffusa*, *Symplocos racemosa*, ***Tinospora cordifolia***, *Solanum nigrum*, *Aspargus racemosus*, *Aloe vera*, *Santalum album*, *Cyperus rotundus*, *Adhatoda vasica*, ***Triphala*** (***Emblica officinalis***, ***Terminalia bellirica***, ***Terminalia chebula***), Dashamoola, ***Trikatu Zingiber officinale, Piper longum, Piper nigrum***), and *Bombax malabaricum*; and powders of Kasisa, Godanti bhasma

and Yashada bhasma. This is a meta-analysis of 8 clinical trials on EveCare in various menstrual irregularities. Inclusion criteria: Clinical studies, which evaluated the role of Evecare in various menstrual irregularities, were included in the meta-analysis. The outcome variables included measurement data on changes in clinical symptoms and signs, laboratory results, and incidence of adverse events during/after treatment. Exclusion criteria: Experimental, Phase I and Phase II clinical studies were excluded from the meta-analysis. The duration of treatment varied from 2 -3 months and in most of the studies, Evecare was given at a dose of 1-2 capsules twice daily or Evecare Syrup-10-15 ml twice daily. Present Meta -analysis of clinical studies indicate safety and efficacy of Evecare in normalizing menstrual irregularities, along with reduction in excessive menstrual bleeding and normalization of character and duration of menstrual flow. Improvement in anemia and altered hormonal levels was also noted in clinical studies.

77. Vaibhav, A. (2016). "**Clinical Evaluation of *Emblica Officinalis* (Amla) Fruit Juice in Obesity**." Imperial Journal of Interdisciplinary Research **3**(1): 2012-2016.

Obesity is increasing day by day across the world irrespective of their economic and developmental condition which is an alarming sign. Preventive measures include dietary restriction, exercise, and antiobesity medicine. The medications used for this disorder cause hazardous side effect on the body on long term use. Keeping above facts in the center a research work has been framed to evaluate the role of an ancient, popular and safe ayurvedic plant drug, ***Emblica officinalis*** (Amla) fruit juice in Obesity. Methodology: In this present study, total 30 obese individuals were randomly selected from Varanasi and nearby districts. All the obese subject were advised to take 20 ml of fresh fruit juice of Emblica officinalis (Amla) empty stomach at morning and evening mix with lukewarm water. Improvement assessed on the basis of change in weight, waist circumference, body mass index (BMI) and Lipid profile. The total duration of study is 45 days with follow-up of 15 days. Result: Significant change in weight, waist circumference, body mass index and Lipid profile level observed in all subjects. Conclusion: Emblica officinalis (Amla) fruit juice effectively controls obesity and related symptoms. It is a cheap and effective therapeutic measure for obese individuals.

78. Vastrad, C. and R. Pakkanavar (2002). "**Clinical evaluation of PIL-28, a herbal formulation in the management of hemorrhoids.**" The Antiseptic **9**(99): 343-344.

Fifty patients of either sex aged between 22 and 63 years entered in the study for the evaluation of safety and efficacy of PIL-28. PIL-28 is a formulation of herbs and minerals designed for the management of hemorrhoids. PIL-28 contains powders of *Balsamodendron mukul*, Shilajeet (purified), *Melia azadirachta* and extracts of *Berberis aristata*, ***Emblica officinalis***, ***Terminalia chebula***, ***Terminalia bellirica***, *Cassia fistula*, *Bauhinia variegata* and *Mesua ferrea* processed in *Commelina salicifolia*, *Mimosa pudica*, *Acorus calamus*, *Blumea lacera*, *Caesalpinia bonducella* and *Amorphophallus campanulatus*. In the group that entered the study, 31 had external hemorrhoids, 10 had internal hemorrhoids and 9 of the patients had both internal as well as external hemorrhoids. The patients were given PIL-28 at a dose of 1 tablet, twice daily for 6 weeks. At the end of the 6 weeks treatment, the patients were evaluated for efficacy and tolerability of PIL-28 tablets. The results revealed that response to PIL-28 was very good in 56.25 % of patients and good in 37.50% of the patients, showing a marked improvement in general health along with a gross reduction of associated symptoms. There were no side effects observed during the treatment and follow-up period.

79. Vyjayanthi, G., S. Shetty, V. S. Saxena, P. D. Nadig, K. Venkateshwarlu, A. Serene, S. Sathyan, D. Bagchi and C. Kulkarni (2003). "**Randomized, double-blind, placebo-controlled trial of Aller-7 in patients with allergic rhinitis.**" Research Communications in Pharmacology and Toxicology **8**(1-2): IV-15-IV-24.

Allergic rhinitis (also known as "hay fever", "rose fever" or "summer catarrh") is the most frequently occurring immunological disorder, which affects men, women and children and imposes a significant cost in terms of suffering and productivity. Allergy is termed as an

excessive reaction to a substance in the environment called an allergen. Pollen, mold, dust, mite and animal allergens that contact the nasal or eye lining cause sneezing, nasal congestion, and itchy, watery, swollen, red eyes. A broad spectrum of therapeutic options are available, however, the cure of allergic rhinitis appears to be far from satisfactory. Aller-7 is a unique combination of extracts from seven medicinal plants including ***Phyllanthus emblica***, ***Terminalia chebula***, ***Terminalia bellirica***, *Albizia lebbeck,* ***Piper nigrum***, ***Zingiber officinale*** *and* ***Piper longum***. A novel, polyherbal formulation (Aller-7) comprising of seven novel medicinal herbal extracts were assessed in a double-blind, placebo-controlled clinical trial in 48 patients (23 males & 25 females) ages 20-45 yrs for a period of 3 months to evaluate its activity in patients suffering from allergic rhinitis. The major symptoms of allergic rhinitis were significantly reduced, while the assessment on the quality of life revealed improvement in 70% of the patients in the Aller-7 supplemented group. Comparison of the nasal and non-nasal symptoms of the Aller-7 and placebo groups showed improvement during the third month in the Aller-7 group as compared to placebo.

80. Vyjayanthi, G., S. Shetty, V. S. Saxena, P. D. Nadig, K. Venkateshwarlu, A. Serene, S. Sathyan, D. Bagchi and C. Kulkarni (2003). "**Randomized, double-blind, placebo-controlled trial of Aller-7 in patients with allergic rhinitis.**" Research Communications in Pharmacology and Toxicology **8**(1-2): IV-15-IV-24.

Allergic rhinitis (also known as "hay fever", "rose fever" or "summer catarrh") is the most frequently occurring immunological disorder, which affects men, women and children and imposes a significant cost in terms of suffering and productivity. Allergy is termed as an excessive reaction to a substance in the environment called an allergen. Pollen, mold, dust, mite and animal allergens that contact the nasal or eye lining cause sneezing, nasal congestion, and itchy, watery, swollen, red eyes. A broad spectrum of therapeutic options are available, however, the cure of allergic rhinitis appears to be far from satisfactory. A novel, polyherbal formulation (Aller-7) of herbal extracts were assessed in a double-blind, placebo-controlled clinical trial in 48 patients (23 males & 25 females) ages 20-45 yrs for a period of 3 months to evaluate its activity in patients suffering from allergic rhinitis. Aller-7 is a unique combination of extracts from seven medicinal plants including ***Phyllanthus emblica***, ***Terminalia chebula***, ***Terminalia bellirica***, *Albizia lebbeck,* ***Piper nigrum***, ***Zingiber officinale*** *and* ***Piper longum***. The major symptoms of allergic rhinitis were significantly reduced, while the assessment on the quality of life revealed improvement in 70% of the patients in the Aller-7 supplemented group. Comparison of the nasal and non-nasal symptoms of the Aller-7 and placebo groups showed improvement during the third month in the Aller-7 group as compared to placebo.

81. Zahra, Y., S. Tehmina, F. Nudrat and R. Zakir ur (2007). "**Pharmacological and clinical evaluation of herbal formulation for the treatment of various hair/scalp problems.**" Pakistan Journal of Scientific and Industrial Research **50**(2): 113-117.

A product formulated from 9 herbs (Acacia concinna pods, ***Emblica officinalis*** syn. ***Phyllanthus emblica*** dried fruits, Nardostachys jatamansi rhizomes, ***Terminalia chebula*** dried fruits, ***Terminalia bellirica*** dried fruits, *Nigella sativa* seeds, *Trigonella foenum-graecum* seeds, *Lagenaria vulgaris* [L. siceraria] seeds, and *Lawsonia alba* [Lawsonia inermis] dried leaves) in a sesamum oil base supplemented with 4 essential oils and vitamin E was evaluated for its efficacy in the treatment of hair/scalp problems. The clinical study was conducted on 175 human volunteers suffering from different kinds of hair and scalp problems. After 2-10 weeks, this formulation was highly effective against head pustules, dryness and brittleness of hair, dandruff, itching, split hair, excessive hair fall, and poor hair growth. The formulation was also effective against headache and sleeplessness. The results of acute oral toxicity test, dermal irritant test and eye irritation test revealed that the product was safe and non-toxic, and had no side effect.

7
Bibliography on Triphala

Published research on Triphala during 1963-2019

A., N. and C. Mendon (2012). "Comparing the effect of different mouthrinses on de Novo plaque formation." Journal of Contemporary Dental Practice **13**(4): 460-463.

Several antiplaque agents are being available in the market in spite of vast development of modern medical science, satisfactory treatment of 'oral diseases' by newer drugs is not fully achieved, rather the chemical compounds has exposed the patients to it is different ill effects, therefore, there is interest to find out effective remedy of any disease by harmless herbal drugs thus the aim of this study was to compare plaque formation at 24 hours after the use of Triphala, Hi ora, Chlorhexidine and colgate plax mouth washes. Methods: A controlled, randomized, double-blind, crossover clinical trial was designed. Thirty subjects underwent four consecutive experimental phases with four treatments: Triphala, Hi Ora, Chlorhexidine and colgate plax. On the day of study, the subjects discontinued all other oral hygiene habits and were randomly assigned for treatment with the experimental mouthwash. Each experimental phase was preceded by a 28- day washout period. Plaque formation was recorded after one undisturbed day. Results: Triphala, Hi Ora and Chlorhexidine reduced de novo plaque formation to a greater extent than the colgate plax mouthwash ($p < 0.05$). Conclusion: Triphala and Hi Ora presents an anti-plaque efficacy similar to that of chlorhexdine, and was more effective at inhibiting plaque formation than the colgate plax mouth wash.

Abraham, S., M. S. Kumar, P. K. Sehgal, S. Nitish and N. D. Jayakumar (2005). "Evaluation of the inhibitory effect of triphala on PMN-type matrix metalloproteinase (MMP-9)." Journal of Periodontology **76**(4): 497-502.

Background: This study evaluated the inhibitory activity of triphala on PMN-type matrix metalloproteinase (MMP-9) expressed in adult periodontitis patients and compared its activity with another ayurvedic drug, kamillosan, and doxycycline, which has known inhibitory activity. Methods: Matrix metalloproteinases (MMPs) were extracted from gingival tissue samples from 10 patients (six males, four females) with chronic periodontitis. Tissue extracts were treated with the drug solutions, the inhibition was analyzed by gelatin zymography, and the percentage of inhibition was determined by a gel documentation system. Results: The activity of MMPs was significantly decreased with the use of the drugs. Triphala showed a 76.6% reduction of MMP-9 activity, whereas kamillosan showed a 46.36% reduction at a concentration of 1,500 µg/ml (crude extract) and doxycycline showed a 58.7% reduction at a concentration of 300 µg/ml (pure drug). Conclusion: The present study showed the strong inhibitory activity of triphala on PMN-type MMPs involved in the extracellular matrix (ECM) degradation during periodontitis.

Adhikari, A., S. Biswas, R. Raman De, A. Mitra, J. Hazra and P. K. Debnath (2013). "Role of Imunomet in upper respiratory tract disorders: A randomized double blind placebo controlled clinical trial." Indian Journal of Traditional Knowledge **12**(2): 281-283.

Upper respiratory tract disorders comprise 87.5% of total acute respiratory morbidity in children in India. This has become a major community health problem. The symptoms are often self limiting and many a time caused by viruses, however, recurrent attacks may lead to distinct morbidity. This study was conducted in hospital outpatient department on children who have been attending at frequent interval with complaints of sore throat, pharyngitis, tonsillitis. They were administered Imunomet syrup or tablet (a multiherbal formulation contains Asparagus racemosus, Triphala, Glycyrrhiza glabra) for a period of 8 weeks. At the end of the treatment, about 84% patients responded well to treatment and 16% patients had fair response to treatment. None of the patients showed any adverse reaction to treatment. The syrup was found to be palatable.

Ahmad, S., Y. T. Kamal, M. Singh, R. Parveen and S. M. Musthaba (2011). "HPTLC determination of gallic acid in crude drugs and herbal formulations." Asian Journal of Chemistry **23**(1): 469-470.

A simple, selective, precise, accurate and cost effective high performance thin layer chromatographic (HPTLC) method for the analysis of gallic acid in some herbal formulations have been developed and validated. Aluminium TLC plate precoated with silica gel 60F254 was used as the stationary phase whereas

ethyl acetate:formic acid (8.5:1.1, v/v) was used as the mobile phase. A compact and well resolved peak of gallic acid was observed by densitometric analysis in the absorbance mode at 272 nm. Calibration curve revealed a good linear relationship between the peak area and concentration. Validation of the developed method also carried out and found to be accurate, precise, specific and reproducible. The method proposed was further applied for estimation of gallic acid in the hydrolyzed samples of three Ayurvedic tablet formulations viz., amla, haritaki and triphala. Hence, newly developed and validated HPTLC method for quantification of gallic acid may be useful in quality control and standardization of several herbal formulations and crude drugs containing phenolics and tannins.

Amanullah, S., H. C. Chandramoorthy, V. A. Kumar and S. Khatheeja (2011). "Antimicrobial activity of triphala against bacterial isolates from HIV infected patients." Jundishapur Journal of Microbiology **4**(SUPPL. 1): S9-S18.

Introduction and objective: The uses of traditional medicinal plants for primary health care have steadily increased worldwide in recent years. Triphala has been used in the traditional medicine for the treatment of variety of diseases and therefore it becomes immense to study the phytochemical compounds and antibacterial activities. Aqueous and alcoholic extracts of both Triphala and its individual components were used, to evaluate antimicrobial activity. Materials and methods: Phytochemical (phenolic, flavonoid and carotenoid) and antibacterial activities of aqueous ethanolic extracts of Triphala and its individual components (Terminalia chebula, T. belerica and Emblica officinalis) were tested against several bacterial isolates. Isolates were recovered from urethral swabs, seminal fluid, urine, high vaginal swabs, skin swabs, blood, and sputum specimen of HIV infected patients. Results: Terminalia chebula has high phytochemical content followed by T. belerica and E. officinalis. In anti-bacterial activity, most of the bacterial isolates were inhibited by the ethanolic and aqueous extracts of T. chebula followed by T. belerica and E. officinalis in both disk diffusion and minimum inhibitory concentration (MIC) methods. But as a whole, Triphala did not show antibacterial activity. MIC of aqueous and ethanolic extracts of Triphala and its individual plant components were observed to vary from 0.1-100μg/ml. Conclusion: In conclusion, this study showed that both ethanolic and aqueous extract of Triphala has potent antibacterial action against the wide variety of bacterial isolates from the HIV infected patients.

Amitabha, M., K. Samagandi and S. K. Kumar (2013). "A pilot study to evaluate the efficacy of triphala madhu sarpi in computer vision syndrome." International Journal of Research in Ayurveda and Pharmacy **4**(6): 800-804.

Computer vision syndrome is an endemic disease of 21st century and an evil consequence of use of computers in improper manner. Being a disease of modern era, it is difficult to get the nearest resembling disease in Ayurveda excellence. Ayurveda being the science of life, everything including ideal life style has been mentioned in it in the form of Dinachairya, Rituchariya, Ratrichariya etc. Computer vision syndrome (CVS) is a disease related to modus Vivendi and it is expected that relief can be obtained by following Dinacharya etc. Present study was planned with an aim and objectives, to compile and commemorate the references of computer vision syndrome and its related diseases in Ayurveda excellence, postulate the Samprapti Ghataka (Patho -physiology) of computer vision syndrome according to Ayurveda, hypothetically and rule out the effect of Triphala Madhu Sarpi in reliving the sign and symptoms of computer vision syndrome. Materials and methods of this pilot study were planned on 10 samples of CVS. Samples were administered with Triphala Madhu Sarpi in a dose of 3 g of Triphala powder along 5 ml of Madhu and 5 ml of Ghrita (Made from Dadhi of pure cow's milk) at night before meal. Effect of intervention was assessed once in 15 days interval. Results of the study revealed that Triphala Madhu Sarpi showed above 75 % relief for most of the subjective criteria's and objective criteria's like dry eye (by schirmer test), and p value were < 0.001 for itching and burning sensation of eye, fatigue and eye strain like conditions i.e. highly significant result after 2 month of therapy.

Amjad, S., A. Jafri, A. K. Sharma and M. Serajuddin (2019). "A novel strategy of nanotized herbal drugs and their delivery in the treatment of diabetes: Present status and future prospects." Journal of Herbal Medicine.

It is now recognised that one of the most far reaching developments in the management of diabetes (Diabetes mellitus) is the targeted delivery of herbal nanoparticles using nano-pumps, smart cells, nanorobots, and nanotized herbal drugs (NHDs). The design, development and targeted delivery of NHDs has now become a frontier research area. Previous research on nano-herbal medicines such as the methanolic extract of Triphala churn nanoparticle, Costus pictus D. Don (insulin plant) silver nanoparticles, and Talinum portulacifolium solid lipid nanoparticles indicated the possibility of overcoming the drawbacks of conventional management of glucose and controlling the complications of diabetes such as delayed wound healing and the side effects of synthetic drugs. Curcumin loaded poly (caprolactone) nanofibers were also found to have beneficial effects for treating diabetic ulcers; hence, the scientific data

available to support the exploration of various nanotized herbal drugs or phyto-constituents which are effective in diabetes treatment and have wound healing capability. This paper focuses on the integration of nanotechnology with herbal remedies for the effective management of diabetes.

Arora, S., E. Brits, S. Kaur, K. Kaur, R. S. Sohi, S. Kumar and L. Verschaeve (2005). "Evaluation of genotoxicity of medicinal plant extracts by the comet and VITOTOX® tests." Journal of Environmental Pathology, Toxicology and Oncology **24**(3): 193-200.

We report the results of our genotoxic evaluation of extracts from three medicinal plants - Acacia nilotica, Juglans regia, and Terminalia chebula - and the herbal drug Triphala employing the VITOTOX® and comet tests. These tests detect DNA damage in prokaryotic and eukaryotic test systems, respectively. In the VITOTOX® test, none of the extracts were identified as genotoxic. In the comet assay, extracts of Acacia nilotica showed statistically significant DNA damage only in a concentration of 2500 ppm (highest tested dose), whereas extracts from Juglans regia showed significant damage in concentrations above 250 ppm and more. Extracts from Terminalia chebula and Tripahala significantly increased DNA damage in a concentration above 500 ppm. This is not considered contradictory, because DNA damage in the alkaline comet assay may not be permanent and hence may not necessarily result in mutations. All the extracts were previously found in the Ames assay to have potent antimutagenic effects against the direct acting mutagens NPD, sodium azide, and the S9-dependent mutagen 2-AF. The results of the previous study using the Ames assay are in conformity with those of the VITOTOX® test. It was found that the extracts were safe in concentrations of up to 1000 µg/0.1 mL and 2500 µg/0.1 mL. A literature survey also showed that plant extracts can be mutagenic as well as antimutagenic depending on the test system used. This indicates that a battery of assays is needed before any conclusion can be reached.

Arora, S., K. Kaur and S. Kaur (2003). "Indian medicinal plants as a reservoir of protective phytochemicals." Teratogenesis Carcinogenesis and Mutagenesis(SUPPL. 1): 295-300.

India is one of the 12 mega diversity countries in the world so it has a vital stake in conservation and sustainable utilization of its biodiversity resources. Plant secondary metabolites have been of interest to man for a long time due to their pharmacological relevance. With this in view, the bark powder of Acacia auriculiformis, A. nilotica, Juglans regia, and the fruit powder of Terminalia bellerica, T. chebula, Emblica officinalis, and a combination drug "Triphala," which are known to be rich in polyphenols, were tested for their antimutagenic activities. Antimutagenic activities of the extracts were estimated by employing the plate incorporation Ames Salmonella histidine reversion assay by using the frame shift mutagen tester strain TA98 and base pair substitution strain TA100 against direct acting mutagens (NPD, sodium azide), and the S9-dependent mutagen 2-aminofluorene(2AF). Acetone extracts of all the plants exhibited significant antimutagenic activities among the other extracts tested, but an acetone extract of Acacia nilotica showed a marked anti-mutagent effect. Furthermore, it was more effective against indirect acting mutagen, 2AF, in both TA98 and TA 100 tester strains of Salmonella typhimurium than against the direct acting mutagens. The results indicate that an acetone extract of bark and fruit of the medicinal plants under study harbors constituents with promising antimutagenic/anticarcinogenic potential that could be investigated further.

Asati, R. K., M. Singhal and M. Saxena (2008). "Antimicrobial study of luteolin 7-O-α-L-rhamnopyranoside from heartwood of Terminalia bellerica (Roxb.)." Journal of Pure and Applied Microbiology **2**(2): 599-602.

Terminalia bellerica (Roxb.) is an important indigenous deciduous medicinal plant and its fruit is an important ingredient of herbal formulation 'Triphala'. In our study, we isolated compound luteolin 7-O-α-L-rhamnopyranoside from the chloroform: ethyl acetate [in the ratio of 70:30] fraction of 95% ethanolic extract of Terminalia bellerica heartwood. Further studies indicated that luteolin 7-O-α-L-rhamnopyranoside has an anti-bacterial effect against Escherichia coli, Salmonella Stanley, Bacillus anthracis and Klebsiella pneumonia. In addition to that luteolin 7-O-α-L-rhamnopyranoside has an anti-fungal activity against Aspergillus niger; Aspergilus flavus, Chrysoporium tropicum. The results in the present study clearly indicate that the isolated compound possess potential broad spectrum antimicrobial activity.

Avula, B., Y. H. Wang, M. Wang, Y. H. Shen and I. A. Khan (2013). "Simultaneous determination and characterization of tannins and triterpene saponins from the fruits of various species of terminalia and phyllantus emblica using a UHPLC-UV-MS Method: Application to triphala." Planta Medica **79**(2): 181-188.

Terminalia species are a rich source of tannins. Many preparations of these species are used in traditional medicine and have many different ethnobotanical applications. A simple UHPLC method was developed

for the simultaneous analysis of such hydrolysable tannins and triterpene saponins from the fruit rinds of different species of Terminalia (T. chebula, T. arjuna, T. bellirica) and Phyllantus emblica. A separation by LC was achieved using a reversed-phase column and a water/acetonitrile mobile phase, both containing formic acid, using a gradient system and a temperature of 40°C. Eight hydrolysable tannins (gallic acid, gallic acid methyl ester, corilagin, chebulagic acid, 1,2,3,6-tetra-O-galloyl-β-D-glucose, ellagic acid, chebulinic acid, and 1,2,3,4,6-penta-O-galloyl-β-D-glucose) and six triterpene saponins (arjunglucoside-I, arjunglucoside-III, chebuloside II, bellericoside, arjunetin, and arjunglucoside-II) could be separated within 20 minutes. The wavelength used for detection with the diode array detector was 254 and 275 nm for tannins and 205 nm for triterpene saponins. The method was validated for linearity, repeatability, limits of detection, and limits of quantification. The developed method is economical, fast, and especially suitable for quality control analysis of tannins and triterpene saponins in various plant samples and commercial products of Terminalia.

Bag, A., S. K. Bhattacharyya, N. K. Pal and R. R. Chattopadhyay (2013). "Antibacterial potential of hydroalcoholic extracts of Triphala components against multidrug-resistant uropathogenic bacteria - A preliminary report." Indian Journal of Experimental Biology **51**(9): 709-714.

"Triphala", the Ayurvedic wonder is used traditionally for the treatment of different types of diseases since antiquity. The hydroalcoholic extracts of the three components of Triphala powder demonstrated varying degrees of strain specific antibacterial activity against multidrug-resistant uropathogenic bacteria. Terminalia chebula fruit extract was active against all the test isolates followed by Terminalia belerica and Emblica officinalis. There was a close association between antibacterial activity and total phenolic content of Triphala components.The test plant extracts were also found to be non-toxic on human erythrocyte membrane at recommended and even higher doses. The preliminary results of the present study may help in developing effective and safe antimicrobial agents from Triphala components for the treatment of urinary tract infections caused by multidrug-resistant bacteria.

Bagde, M. L., M. S. Deshpande and S. V. Deshpande (2015). ""Role of Rasayana Chikitsa in Complications of Madhumeha with Special Reference to Micro Vascular Complications"–Systemic Review." NJIRM **6**(1): 81-87.

Background & objective: Present era is full of stress & strain due to competitive life style. Change in dietary habit leads to upsurge of Diabetes. Diabetes associated with long term potential effect on almost all systems of body. It leads to various complications. These complications can be managed by Rasayana Chikitsa (Rejuvenation therapy) according to Ayurveda which nourishes, develops & corrects the vitiated Saptadhatu. Objective: To study the Micro vascular complications in Madhumeha. To study Rasayana dravya from samhitas. To evaluate the Karmukatva (Activity) of Rasayana dravya on Micro vascular complications. Material and Methodology: Literary study of Rakta-Medodushti in complications of Madhumeha thoroughly including Charaksamhita, Sushrut samhita & Vagbhat samhita was done. Literary study of micro vascular complication of Diabetes was done, Karmukatva(Activity) of Rasayana dravya on micro vascular complications was studied. Result: Diabetic Neuropathy, Nephropathy & Retinopathy are the micro vascular complications of Madhumeha. These complications are mainly due to Rakta- Medo dushti. The Suvarna& Raupya bhasma are sheetveerya & rasayana which acts specifically as balya& give strength to nerves in Diabetic neuropathy. Medovaha& Mootravaha srotasdushti in Diabetic nephropathy cause structural changes in glomeruli. This structural change is corrected by Haridra&Triphala by their rasayana effect. Triphala act as Mehaghna (antidiabetic) by Pachana of vikrit meda. Haridra act as Medoghna (lipolytic);as it possesses laghu, ruksha guna, it reduces sclerosis. There is Rakta dushti in Retinopathy which is marked by retino vascular micro aneurysm & blot hemorrhages. Manjishtha have Pachana (digestive) & Shaman (palliative) effect on Raktagata Kapha-Pitta. It acts as rakataprasadana (blood purifier), vranaropana (wound healing). Suvarnamakshika bhasma is raktaprasadaka, acts on hemorrhagic disorders such as Retinal haemorrhages. Conclusion: On the basis of above study, Rasayana dravyas improve quality of life by alleviating micro vascular complications.

Bahulikar, A. S., R. V. Kashalkar and M. D. Pundlik (2003). "Chromatographic studies on Triphala." Asian Journal of Chemistry **15**(1): 155-159.

Chromatographic studies on Triphala, a well known ayurvedic formulation, prepared from three constituents, viz., Haritaki, Beheda and Amalaki, have been carried out with a view to standardize the formulation. Thin layer chromatographic studies were carried out using precoated silica gel fluorescent plates on the aqueous extracts and ethyl acetate extracts of the three constituents and also Triphala. The choice of the solvent system toluene-ethyl acetate-formic acid is discussed and its utility is demonstrated

for complete resolution of gallic acid from other components. Gallic acid therefore can be used as a marker compound for standardizing Triphala.

Bahulikar, A. S., R. V. Kashalkar and M. D. Pundlik (2003). "HPLC in standardization of herbal drugs: Studies on triphala powder." Asian Journal of Chemistry **15**(1): 229-234.

High performance liquid chromatography (HPLC) is a very efficient method for the analysis of herbal drugs and herbal preparations, because of its ability to simultaneously separate, identify and analyse the complex mixture of organic substances. In the present communication we report the HPLC analysis of the ayurvedic drug, Triphala powder and demonstrate the utility of the technique in standardizing the ayurvedic drug.

Bahulikar, A. S., R. V. Kashalkar and M. D. Pundlik (2003). "Infrared spectrophotometry in studies on herbal drug Triphala Churna." Asian Journal of Chemistry **15**(2): 851-854.

Infrared spectrophotometry is a useful analytical technique for the identification of drugs and is recommended as one of the parameters for testing in various pharmacopoeias. At present the Ayurvedic Pharmacopoeia is not referring to sophisticated instrumental analytical techniques for the purpose of characterization and identification of Ayurvedic formulations. The present work demonstrates the utility of the IR spectrophotometry in the identification and characterization of Triphala, based on typical characteristic IR frequencies for identifying the herbal drug.

Bais Sanjay, K., V. Chandewar Anil and R. L. Bakal (2011). "Comparative evaluation of microbiological quality of Triphala churna marketed In Yavatmal District of India." Research Journal of Pharmacy and Technology **4**(3): 402-404.

In the present study herbal products marketed in Yavatmal District of India were determined for the presence of microbial. Microbial contents in herbal products were examined as suggested in as per W.H.O. The total of ten herbal products of various brands were selected randomly and tested for microbial contamination. Of which 3 samples did not conform to the W.H.O guidelines. The formulations are used daily by the patients suffering from constipation. The specific medias were used to determining the presence of Escherichia coli (4 samples), Staphylococcus aureus (3 samples), and P. aeruginosa (4 samples). The data indicated suggest that there is requirement of in process improvement to provide better quality for consumer health in order to be competitive in international markets.

Bais, S. K. and A. V. Chandewar (2011). "Comparative evaluation of endosulfan content in Triphala Churna marketed in Yavatmal District of India by HPLC method." International Journal of Pharmacy and Pharmaceutical Sciences **3**(SUPPL. 3): 35-40.

In the present study herbal products marketed in Yavatmal District of India were determined for the presences of Endosulfan contents in herbal products were examined. The total of ten herbal products of various brands were selected randomly and tested for pesticide content. Of which 2 samples (H3 & H4) showing the presence of Endosulfan but within the limit given by W.H.O. The formulations are used daily by the patients suffering from constipation. The method reported was used for analysis of pesticide content in the present work for determination of Endosulfan content in Triphala Churna formulations in which chromatographic conditions were mobile Phase 0.1% acetic acid in Acetonitrile Flow rate 1 ml/min, using Column C18,indicating the Endosulfan content in formulation no H3.(0.025ppm), and H4, (0.04 ppm), but the pesticide contamination indicated in such herbal formulation was in permissible limit as per WHO specification (0.05 ppm).The data indicated suggest that there is requirement of in process improvement to provide better quality for consumer health in order to be competitive in international markets.

Bais, S. K., A. V. Chandewar, C. K. Gadewar, A. P. Dewani and S. M. Charjan (2011). "Comparative evaluation of heavy metals in triphala churna marketed in India." Asian Journal of Chemistry **23**(4): 1879-1880.

In order to ascertain accumulation of heavy metals including, arsenic, cadmium and lead in marketed triphala churna in Yavatmal city, investigations were performed by using atomic absorption spectrometry. The results showed heavy metals accumulation in herbal medicines procured from local market. The main purposeof the investigation was to document evidence for the users, collectors and practitioners of marketed triphala churna. In present research work heavy metal like arsenic, cadmium and lead were analyzed in herbal medicines by atomic absorption spectroscopy. It is found that arsenic content in herbal formulations H2 (0.02 ppm), H3 (0.03 ppm), H4 (0.02 ppm), H5 (0.07 ppm), H7 (0.02 ppm), H8 (0.03 ppm), H9 (0.02) and H10 (0.93 ppm) which is below the permissible limit in all formulations. The cadmium content in H2 (14.15 ppm), H3 (0.41 ppm), H4 (0.87 ppm), H5 (0.93 ppm), H7 (14.16 ppm), H8 (0.41 ppm), H9 (0.88

ppm) and H10 0.93 ppm. The lead content is below detectable level in all formulations. Such formulations are injurious to health of patient if consumed regularly.

Bajaj, N. and S. Tandon (2011). "The effect of Triphala and Chlorhexidine mouthwash on dental plaque, gingival inflammation, and microbial growth." International Journal of Ayurveda Research **2**(1): 29-36.

The objective of this study was to ascertain the effects of a mouthwash prepared with Triphala on dental plaque, gingival inflammation, and microbial growth and compare it with commercially available Chlorhexidine mouthwash. This study was conducted after ethics committee approval and written consent from guardians (and assent from the children) were obtained. A total of 1431 students in the age group 8-12 years, belonging to classes fourth to seventh, were the subjects for this study. The Knowledge, Attitude and Practice (KAP) of the subjects was determined using a questionnaire. The students were divided into three groups namely, Group I (n = 457) using Triphala mouthwash (0.6%), Group II (n = 440) using Chlorhexidine mouthwash (0.1%) (positive control), and Group III (n = 412) using distilled water (negative control). The assessment was carried out on the basis of plaque scores, gingival scores, and the microbiological analysis (Streptococcus and lactobacilli counts). Statistical analysis for plaque and gingival scores was conducted using the paired sample t-test (for intragroup) and the Tukey's test (for intergroup conducted along with analysis of variance test). For the Streptococcus mutans and Lactobacillus counts, Wilcoxon and Mann-Whitney test were applied for intragroup and intergroup comparison, respectively. All the tests were carried out using the SPSS software. Both the Group I and Group II showed progressive decrease in plaque scores from baseline to the end of 9 months; however, for Group III increase in plaque scores from the baseline to the end of 9 months was noted. Both Group I and Group II showed similar effect on gingival health. There was inhibitory effect on microbial counts except Lactobacillus where Triphala had shown better results than Chlorhexidine. It was concluded that there was no significant difference between the Triphala and the Chlorhexidine mouthwash.

Baliga, M. S. (2010). "Triphala, ayurvedic formulation for treating and preventing cancer: A review." Journal of Alternative and Complementary Medicine **16**(12): 1301-1308.

Background: Triphala (Sanskrit tri=three and phala=fruits), composed of the three medicinal fruits Phyllanthus emblica L. or Emblica officinalis Gaertn., Terminalia chebula Retz., and Terminalia belerica Retz. is an important herbal preparation in the traditional Indian system of medicine, Ayurveda. Triphala is an antioxidant-rich herbal formulation and possesses diverse beneficial properties. It is a widely prescribed Ayurvedic drug and is used as a colon cleanser, digestive, diuretic, and laxative. Cancer is a major cause of death, and globally studies are being conducted to prevent cancer or to develop effective nontoxic therapeutic agents. Experimental studies in the past decade have shown that Triphala is useful in the prevention of cancer and that it also possesses antineoplastic, radioprotective and chemoprotective effects. Conclusions: This review for the first time summarizes these results, with emphasis on published observations. Furthermore, the possible mechanisms responsible for the beneficial effects and lacunas in the existing knowledge that need to be bridged are also discussed.

Baliga, M. S., S. Meera, B. Mathai, M. P. Rai, V. Pawar and P. L. Palatty (2012). "Scientific validation of the ethnomedicinal properties of the Ayurvedic drug Triphala: A review." Chinese Journal of Integrative Medicine **18**(12): 946-954.

Triphala, a herbal formula composed of the three fruits of Terminalia chebula Retz. (Haritaki, Family: Combretaceae), Terminalia bellirica Roxb. (Bibhitaki, Family: Combretaceae) and Phyllanthus emblica Linn. or Emblica officinalis Gaertn. (Amalaki or the Indian gooseberry, Family: Euphorbiaceae) is considered to be a universal panacea in the traditional Indian system of medicine the Ayurveda. It has been described in the Ayurveda text as a "Rasayana' and to rejuvenat the debilitated organs. Ayurvedic physicians use Triphala for many ailments but most importantly to treat various gastrointestinal disorders. Scientific studies carried out in the past two decades have validated many of the ethnomedicinal claims and researches have shown Triphala to possess free radical scavenging, antioxidant, antiinflammatory, antipyretic, analgesic, antibacterial, antimutagenic, wound healing, anticariogenic, antistress, adaptogenic, hypoglycaemic, anticancer, chemoprotective, radioprotective and chemopreventive effects. Clinical studies have also shown that Triphala was found to have good laxative property, to improve appetite and reduce gastric hyperacidity. Studies have also shown that Triphala was effective in preventing dental caries and that this effect was equal to that of chlorhexidine. The current review addresses the validated pharmacological properties of Triphala and also emphasizes on aspects that need further investigation for its future clinic application.

Baliga, M. S., S. Meera, M. P. Rai, E. Saldanha, S. Pais, D. Jayachander and P. L. Palatty (2015). Use of the Ayurvedic Drug Triphala in Medical Conditions Afflicting Older Adults. Foods and Dietary Supplements in the Prevention and Treatment of Disease in Older Adults, Elsevier Inc.**:** 135-142.

Aging, a physiological state in which there is a progressive decline in organ functions, delay in regeneration, and development of age-related diseases, is a multifactorial process. Ayurveda, the traditional Indian system of medicine which, when translated literally, means science of life, recommends the use of certain herbal drugs to retard aging. The present chapter addresses the health benefit of Triphala, an herbal formulation composed of the three fruits of Terminalia chebula Retz. (Haritaki, family Combretaceae), Terminalia bellirica Roxb. (Bibhitaki, family Combretaceae) and Phyllanthus emblica Linn. or Emblica officinalis Gaertn. (Amalaki or the Indian gooseberry, family Euphorbiaceae). It is accredited to be a rejuvenating drug and to give strength to debilitated organs. Scientific studies carried out in the past two decades have validated many of the ethnomedicinal claims, and research has shown Triphala to possess beneficial effects in many geriatric conditions. The current chapter addresses the validated pharmacological properties.

Baliga, M. S., S. Meera, A. R. Shivashankara, P. L. Palatty and R. Haniadka (2015). The Health Benefits of Indian Traditional Ayurvedic Rasayana (Anti-aging) Drugs: A Review. Foods and Dietary Supplements in the Prevention and Treatment of Disease in Older Adults, Elsevier Inc.**:** 151-161.

Aging, a physiological state in which there is a progressive decline in organ functions, delay in regeneration, and development of age-related diseases, is a multifactorial process. Free radicals are proposed to initiate/enhance aging, and antioxidants and phytochemicals have been shown to possess anti-aging properties. These drugs are also believed to be good tonics, rejuvenatives, immune stimulators, and adaptogens. Regular consumption of these drugs is considered to enhance physical strength, increase sex drive, and improve the complexion. They are mostly polyherbal in composition, and are comprised of medicinal plants, minerals, pearls, and coral. This chapter addresses, for the first time, the benefit and scientifically validated properties of commonly used Rasayana drugs such as Amalakayas Rasayana, Triphala, Chyawanprash, Aamalaki Rasayana, Amrita Rasayana, Brahm Rasayana, Ashwagandha Rasayana, Narasimha Rasayana, Brahmi Rasayana Amritaprasham, Anwala churna, and Amalkadi Ghrita with emphasis on the possible mechanisms responsible for the beneficial effects of these drugs.

Baliga, M. S., S. Meera, L. K. Vaishnav, S. Rao and P. L. Palatty (2013). "Rasayana drugs from the ayurvedic system of medicine as possible radioprotective agents in cancer treatment." Integrative Cancer Therapies **12**(6): 455-463.

The use of ionizing radiation, which is the cornerstone of cancer treatment, is compromised by the radiosensitivity of normal tissues. A chemical that can give selective benefit to the normal cells against the deleterious effects of ionizing radiation has been a long-sought goal. However, most of the compounds studied have shown inadequate clinical application owing to their inherent toxicity, undesirable side effects, and high cost. Studies carried out in the past 2 decades have shown that some of the classical Indian Ayurvedic drugs (Amritaprasham, Ashwagandha Rasayana, Brahma Rasayana, Chyavanprasha, Narasimha Rasayana, and Triphala Churna) possess radioprotective effects. In the current review, an attempt is made to summarize the radioprotective observations of these Ayurvedic drugs and the mechanisms responsible for the radioprotective effects.

Baliga, M. S., A. R. Shivashankara, S. Meera, P. L. Palatty, R. Haniadka and R. Arora (2013). The Health Benefits of the Ayurvedic Anti-Aging Drugs (Rasayanas): An Evidence-Based Revisit. Bioactive Food as Dietary Interventions for the Aging Population, Elsevier Inc.**:** 209-226.

Aging, a physiological state in which there is a progressive decline in organ functions, delay in regeneration, and development of age-related diseases, is a multifactorial process. Free radicals are supposed to initiate/enhance aging and the use of antioxidants and phytochemicals are shown to possess antiaging properties. These drugs are also supposed to be good tonics, rejuvenatives, immune stimulators, and adaptogens. Regular consumption of these drugs is supposed to enhance physical strength, increase sex drive, and improve complexion. These drugs are mostly polyherbal in composition and are made from medicinal plants, minerals, pearls, and coral. The present review addresses the health benefit of some commonly used Rasayana drugs like Triphala, Chyawanprash, Amalaki Rasayana, Amrit Rasayana, Brahma Rasayana, Ashwagandha Rasayana, Narasimha Rasayana, Brahmi Rasayana, Amritaprasham, Anwala churna, and Amalkadi Ghrita with emphasis on the possible mechanisms responsible for the beneficial effects of these drugs.

Banjare, J. and S. Bhalerao (2016). "A survey of marketed ayurvedic/herbal anti-obesity products." International Journal of Pharmacy and Pharmaceutical Sciences **8**(8): 384-386.

Objective: Ayurvedic/herbal medicines are easy to access and hence are becoming alternative for obesity management. The present study was done to find out the availability of herbal anti-obesity drugs in pharmacy and online website. Methods: A cross-sectional survey on ayurvedic/herbal drugs in local pharmacies was conducted in order to obtain data for accessible marketed anti-obesity formulations. A total of 15 pharmacies and 40 online websites were selected randomly and data available with respect to the anti-obesity formulations using predefined criteria was collected. Results: The information revealed the presence of 65 formulations on these two outlets. The study showed 20 (31%) products were available in pharmacies, 15 (23%) were available only through online shopping while 30 (46%) products were available for marketing at both the places. The study results showed that highest 41% of the herbal medicine have triphala followed by garcinia and guggul as part of the composition or used individually. As per pharmacist, 60-70% of herbal anti-obesity drugs are being purchased without a prescription. There are many online websites available, selling herbal anti-obesity drugs with titles of safety and guaranteed weight loss. Conclusion: The study revealed the rampant availability of ayurvedic/herbal drugs in the market possibly due to the attractive names, tall claims and assumed safety about these drugs.

Banjare, J., P. Raina, P. Mansara, R. K. Ghanekar and S. Bhalerao (2017). "Triphala, regulates adipogenesis through modulation of expression of adipogenic genes in 3T3-L1 Cell line." Pharmacognosy Magazine **13**(52): S834-S839.

Background: Triphala, an Ayurvedic polyherbal formulation, is used for the treatment of various diseases including obesity. Objective: The present study was planned to evaluate the anti-adipogenic potential of aqueous extract of Triphala (TPaq) using 3T3-L1 adipocyte cell line model. Methods: The effect of aqueous extract of Triphala (TPaq) was tested on the viability of 3T3- L1 cells by MTT assay. The cells were treated with a cocktail of dexamethasone (DEX), isobutylmethylxanthine (IBMX) and insulin to induce adipogenesis. The cells were treated either with the induction cocktail or with the cocktail containing different concentrations (1, 10 and100 µg/ml) of TPaq. Intracellular lipid content was analyzed using Oil O Red stain and was quantified after extracting with isopropanol at 500 nm wavelength. The expression of early (PPAR-γ and C/EBP-α) and late (GLUT4 and FAS) phase adipogenic genes was studied by real time PCR. Results: TPaqdid not affect the viability of 3T3-L1 cell line. Interestingly, TPaqinduced a concentration dependant decrease in the intracellular lipid content and expression of both early and late phase adipogenic genes. This decrease was statistically significant compared to cells treated with only induction cocktail. Conclusion: These results suggested that Triphala regulated lipid accumulation by down regulating expression of adipogenic genes, resulting into prevention of adipogenesis. Abbreviations used: TPaq: Aqueous extract of Triphala; DMEM: Dulbecco's Modified Eagle's medium; FBS: Fetal Bovine Serum; IBMX: Isobutyl methylxanthine; DMX: Dexamethasone; MTT: [3-(4, 5-dimethylthiazol-2-yl)-2, 5-diphenyltetrazolium bromide] assay; PPARγ: Peroxisome proliferator-activated receptor; C/EBP: Enhancer binding protein α, FAS:Fatty acid synthase; Glut-4: Glucose phosphate transporter 4.

Baratakke, S. U., R. Raju, S. Kadanakuppe, N. R. Savanur, R. Gubbihal and P. S. Kousalaya (2017). "Efficacy of triphala extract and chlorhexidine mouth rinse against plaque accumulation and gingival inflammation among female undergraduates: A randomized controlled trial." Indian Journal of Dental Research **28**(1): 49-54.

Aim: To know the efficacy of Triphala extract and Chlorhexidine mouth rinse against plaque and gingival inflammation. Materials and Methods: A double blinded parallel arm randomised control trial was done among 60 participants aged 18-24 years. Participants were randomly allotted to three groups with 20 participants in each group of 0.6% triphala, 0.12% chlorhexidine and control group. Study was done in 2 phases of 21 days duration. During the experimental period, participants rinsed with the allocated mouth rinse 10ml twice daily for 30 seconds without any supervision. The plaque and gingival status were assessed using Silness and Loe and Loe and Silness at baseline and end of the phase. Statistical Analysis Used: The results were analysed using ANOVA (Analysis of Variance), Wilcoxon sign rank test and post hoc test with significant level at P value < 0.05. Results: Triphala and Chlorhexidine showed significant reduction in plaque and gingival scores as compared to Control group (P < 0.001). No significant difference was found between the plaque and gingival scores obtained with triphala extract and chlorhexidine mouth rinse. Conclusion: Triphala extract mouth rinse was effective in reducing plaque accumulation and gingival inflammation with reported no side effects.

Baskaran, U. L., S. J. Martin, R. Mahaboobkhan and S. E. Prince (2015). "Protective role of Triphala, an Indian traditional herbal formulation, against the nephrotoxic effects of bromobenzene in Wistar albino rats." Journal of Integrative Medicine **13**(2): 115-121.

OBJECTIVE: The purpose of the present study was to evaluate the nephroprotective and antioxidant properties of Triphala against bromobenzene-induced nephrotoxicity in female Wistar albino rats. METHODS: Animals were divided into five groups of six rats and treated as follows: Group I was a normal control and received no treatment, Group II received only bromobenzene (10 mmol/kg), Groups III and IV received bromobenzene and Triphala (250 and 500 mg/kg, respectively), Group V received Triphala alone (500 mg/kg), and Group VI received bromobenzene and silymarin (100 mg/kg). Antioxidant status and serum kidney functional markers were analyzed. RESULTS: Bromobenzene treatment resulted in significant ($P < 0.05$) decreases in the activities of antioxidant enzymes such as catalase, superoxide dismutase, glutathione-S-transferase and glutathione peroxidase as well as total reduced glutathione. There was a significant ($P < 0.05$) increase in lipid peroxidation in kidney tissue homogenates. There were significant ($P < 0.05$) reductions in the levels of serum total protein and albumin as well as significant ($P < 0.05$) increases in serum creatinine, urea and uric acid. The oral administration of two different doses (250 and 500 mg/kg) of Triphala in bromobenzene-treated rats normalized the tested parameters. The histopathological examinations of kidney sections of the experimental rats support the biochemical observations. CONCLUSION: Triphala treatment alleviated the nephrotoxic effects of bromobenzene by increasing the activities of antioxidant enzymes and reducing the levels of lipid peroxidation and kidney functional markers.

Baskaran, U. L., M. Rasool and E. P. Sabina (2014). "Alleviation of the hepatotoxic effect of bromobenzene by the Indian traditional herbal formulation Triphala in experimental rats." Oriental Pharmacy and Experimental Medicine **14**(4): 369-374.

The present study is an attempt to investigate the efficacy of Triphala in ameliorating the hepatotoxic effects of bromobenzene (BB) in experimental rats. Hepatotoxicity was induced in rats by oral administration of BB (1.57 mg/kg b.w.) and Triphala was given orally at two doses of 250 and 500 mg/kg b.w. for a period of 8 days. The antioxidant status was studied by measuring lipid peroxidation, total reduced glutathione levels and enzymes such as catalase (CAT), superoxide dismutase (SOD), glutathione peroxidase (GPx) and glutathione-S-transferase (GST) in liver tissue homogenates. In addition, the levels of cytokines such as tumour necrosis factor-α (TNF-α) and interleukin-1β (IL-1β) were measured in serum. The hepatoprotective role of Triphala was compared with that of the standard hepatoprotective agent silymarin. The treatment of BB-intoxicated rats with Triphala showed significant ($p < 0.05$) increase in the antioxidant status and significant ($p < 0.05$) reduction in the levels of Tumour Necrosis Factor-α (TNF-α), Interleukin-1β (IL-1β). The histopathological findings further confirmed the protective role of Triphala against BB-induced hepatotoxicity in rats. From the results obtained in this study, it can be concluded that treatment with Triphala alleviated the hepatotoxic effect of BB in experimental rats.

Bazracharza, A., M. Rana, B. Roy, A. Tiwari and A. Tripathi (2015). "Optical characterization of medicinal plants extracts used for the treatment of diabetes." Journal of Herbs, Spices and Medicinal Plants **21**(1): 86-101.

The fluorescence and absorption spectroscopy on the medicinal plants extracts used for the cure of diabetes in Eastern Himalayan region viz. Darjeeling and Sikkim are presented. The extracts from the seeds of Totola (Oroxylum indicum Vent.) and fruits of Harra (Terminalia chebula Retz.) and Barra (Terminalia belerica Roxb.) are studied using thin layer chromatography and atomic absorption spectroscopy. The results are compared with those of commercially prepared polyherbal formulations from Totola, Harra and Barra viz. Dashmool Kwath, Haritaki Churna and Triphala Churna.

Belapurkar, P., P. Goyal and P. Tiwari-Barua (2014). "Immunomodulatory effects of triphala and its individual constituents: A review." Indian Journal of Pharmaceutical Sciences **76**(6): 467-475.

The role of plant extracts and Ayurvedic polyherbal preparations in treating various ailments has been acknowledged since time immemorial. Studies based on the effect of these extracts in treatment of different diseases have also been well documented. Indian medicinal literature also emphasizes the synergistic effect of polyherbal drugs in restoring and rejuvenating immune system. This review focuses on the immunomodulatory potential of the polyherbal preparation, Triphala and its three constituents, Terminalia bellerica, Terminalia chebula and Emblica officinalis. The role of Triphala and its extract has been emphasized in stimulating neutrophil function. Under stress condition such as noise, Triphala significantly prevents elevation of IL-4 levels as well as corrects decreased IL-2 and IFN-γ levels. Under the condition of inflammatory stress its immunosuppressive activity is attributed to its inhibitory action on complement system, humoral immunity, cell mediated immunity and mitogen-induced T-lymphocyte proliferation. The aqueous and alcoholic extracts of the individual constituents reportedly enhance especially the macrophage activation due to their free radical scavenging activity and the ability to

neutralize reactive oxygen species. This study thus concludes the use of Triphala and its three individual constituents as potential immunostimulants and/or immunosuppressants further suggests them to be a better alternative for allopathic immunomodulators.

Bharathi, K. and R. Swamy (2015). "Role of ayurvedic drugs in treating geriatric disorders and in improving the quality of life: A demonstrative project." International Journal of Ayurveda and Pharma Research **3**(12): 65-68.

Present study is a demonstrative trial taken up with the aim of establishing the safety and efficacy of compound Ayurvedic drugs in geriatric people, who are institutionalised at old age home. Patients recruited under this study were suffering with minor to moderate ailments and given disease specific Ayurvedic medicines along with them one Rasayana drug like Ashvagandha/ Triphala/ Yashtimadhu/ Amalaki. Mini mental status examination (MMSE) and Hamilton Anxiety Rating Scale (HARS) tests were applied initially and after completion of six months to evaluate the efficacy of Ayurvedic drugs in treating the Geriatric problems and enhancing the quality of life on total 30 subjects recruited for this study. All the patients were undergone blood tests before and after treatment for their kidney and liver function tests. On analysis of MMSE, it is found that total 16 (53.34) cases were showed improvement; in the HARS – Psychic level, majority of cases showed improvement in all the parameters viz., anxiety, tension, fear, insomnia, intellectual and depression; similarly in the HARS-somatic level, showed improvement in all the parameters - General Somatic (muscular), General Somatic (sensory), cardio-vascular, respiratory, gastro-intestinal, genito-urinary and autonomic system symptoms. Blood markers of liver and kidney function were within normal limits in all patients before and after treatment. This indicates that the used Ayurvedic drugs are safe even in the geriatric people.

Bhargava, K. Y., S. Aggarwal, T. Kumar and S. Bhargava (2015). "Comparative evaluation of the efficacy of three anti-oxidants vs NAOCL and EDTA: Used for root canal irrigation in smear layer removal–Sem study." International Journal of Pharmacy and Pharmaceutical Sciences **7**(6): 366-371.

Objective: The aim of this study was to compare the efficacy of 3 Anti-Oxidants versus NaOCl and EDTA: used for root canal irrigation in smear layer removal by SEM analysis. Methods: Root canal treatment was performed on 100 single rooted teeth and the smear layer removing abilities of Neem, Triphala, Amla EDTA and Saline were checked by using them as the last irrigant. Results: EDTA and Amla showed the best smear layer removing ability followed by Neem and Triphala. Conclusion: Neem, Triphala and Amla showed the potential to remove the smear layer. EDTA showed the maximum efficacy in removing the smear layer.

Bhat, P. M. (2016). "Study on the role and efficacy of Triphala Ghrita Aschyotan in Vataj Abhishyanda wrt Allergic Conjunctivitis." International Journal of Ayurvedic Medicine **7**(2).

Allergic conjunctivitis is a common ophthalmic problem predominantly affecting the outdoor workers. The eyes are exposed to different environmental factors. The eye and eyelids are very common sites for allergic reactions. About 50% of conjunctivitis seen by primary physicians is allergic in nature. Vataj Abhishyanda is a clinical entity which can be correlated with allergic conjunctivitis. Triphala Ghrita Aschyotan helps to relieve the symptoms of Vataj Abhishyand w.r.t allergic conjunctivitis. Triphala Ghrita is a Vyadhi Pratyanik Dravya and helpful in topical eye allergies. Aim: To study the role and efficacy of Triphala Ghrita Aschyotan in Vataj Abhishyanda w.r. t. allergic conjunctivitis. Materials and Method: A total 60 patients of the age group 15-60 years presenting with signs and symptoms of Vataj Abhishyanda w.r.t allergic conjunctivitis were selected randomly from OPD of the department of Shalakyatantra, Government Ayurved College, Nanded (M.S.) within inclusion criteria and were treated in two groups. The 30 patients of trial group were treated with Triphala Ghrita Aschyotana and patients of control group in similar number were subjected to Ketotifen Fumarate eye drop. Results: The trial drug Triphala Ghrita is equally effective as compared to Ketotifen eye drop. Trial drug provided more relief in symptoms like Sangharsha (Itching of eyes), which is the parameter of efficacy. Conclusion:Triphala Ghrita Aschyotan is an effective, safe and potent treatment of Vataj Abhishyanda w.r.t allergic conjunctivitis.

Bhati, H. and R. Manjusha (2015). "Clinical study on evaluation of anti-cataract effect of Triphaladi Ghana Vati and Elaneer Kuzhambu Anjana in Timira (immature cataract)." AYU (An international quarterly journal of research in Ayurveda) **36**(3): 283.

Introduction: Senile cataract is the leading cause of blindness according to the World Health Report, 1998. Till date no accepted medical treatment is available for cataract. In Ayurveda visual disturbances are described in the context of Timira, Kacha and Linganasha. Timira is an early stage characterized by blurring of vision and Linganasha is end stage where complete loss of vision occurs. Ancient scholars have

advocated different Anjana application and oral medications in the Timira and Kacha stage. Aim: To study the efficacy of test drugs Triphaladi Ghana Vati and Elaneer Kuzhambu Anjana in immature cataract. Materials and Methods: In this trial patients having Senile Immature Cataract were randomized with equal probability to one of the two treatment Groups A and B (n = 20 each). In Group A Triphaladi Ghana Vati 500 mg internally for 3 months and in Group B Triphaladi Ghana Vati 500 mg internally and Elaneer Kuzhambu Anjana for local application were given. Assessment was done on the basis of blurring of vision, visualization of nonexisting things, difficulty in bright light and dim light or night vision, distant visual acuity, pinhole vision, best corrected visual acuity and cataract grading on slit lamp. Results: Both groups showed statistically significant changes in blurring of vision, difficulty in glare, daytime and bright light, distant visual activity, pinhole vision, and best-corrected visual acuity. Group B also showed significant changes in difficulty in night time, visualization of nonexisting things and in nuclear cataract. Conclusion: The study establishes that test drugs can reduce and control the progress of immature cataract, and combined therapy was found more effective. Chakshushya Rasayana, early diagnosis and proper management on Doshic lines can prevent arrest or delay senile cataract.

Bhatnagar, S., A. Rani and R. Kumari (2015). "Therapeutic potential of triphala against human diseases." International Journal of Pharmaceutical Sciences Review and Research **31**(2): 5-13.

Triphala a combination of extract is derived from dried fruits of Emblica officinalis, Terminalia chebula and Terminalia bellerica, in equal proportions (1:1:1). The mixture and its individual ingredients are highly valued in the field of Ayurveda and considered as a controller of the human system aiding digestion, nutrient absorption and body metabolism. Triphala is known for its medicinal properties such as anti-aging, antianaemic, antibacterial, anticancerous, antidiabetic, antidiarrhoeal, antimutagenic, antioxidant, antiparasitic, antiviral, cardio protective, hepatoprotective, hypocholesterolaemic, radio protective and colon cleanser. All of the three constituents of Triphala are active and shows slight difference in activities under different sets of environmental conditions but the combination all three showed a significant and efficient effect as compared to individual components. Triphla is rich in active ingredients like tannins, carbohydrates, saponins, ellagic acid, sorbitol and ascorbic acid. The present review paper focuses on the potential of Triphala as therapeutic agent against various diseases.

Bhattacharjee, R., S. Nekkanti, N. G. Kumar, K. Kapuria, S. Acharya and K. C. Pentapati (2015). "Efficacy of triphala mouth rinse (aqueous extracts) on dental plaque and gingivitis in children." Journal of Investigative and Clinical Dentistry **6**(3): 206-210.

Aim The aim of the present study was to evaluate the efficacy of triphala mouth rinse (aqueous) in the reduction of plaque and gingivitis among children. Methods The study was a randomized, double-blinded, controlled trial, with a total of 60 school children (n = 30 in each group; triphala and chlorhexidine groups). Plaque and gingival indices were used to evaluate baseline and follow-up plaque and gingivitis. Results A total of 57 children completed the study. Both chlorhexidine and triphala groups showed significantly lower mean gingival and plaque index scores at follow up than baseline (P < 0.001). There was no significant difference in the percentage change in the mean gingival index between the two groups (P = 0.826). The percentage change in the mean plaque index was significantly higher in the chlorhexidine group compared to the triphala group (P = 0.048). Conclusion The effectiveness of triphala in the reduction of plaque and gingivitis was comparable to chlorhexidine, and can be used for short-term purposes without potential side-effects. It is a cost-effective alternative in reducing plaque and gingivitis.

Biradar, Y. S., S. Jagatap, K. R. Khandelwal and S. S. Singhania (2008). "Exploring of antimicrobial activity of Triphala Mashi - An Ayurvedic formulation." Evidence-based Complementary and Alternative Medicine **5**(1): 107-113.

Triphala Mashi is an ayurvedic formulation that was prepared in our lab. Aqueous and alcoholic extracts of both Triphala and Triphala Mashi were used, to evaluate antimicrobial activity. Comparative phytochemical profile of Triphala and Triphala Mashi was done by preliminary phytochemical screening, total phenolic content and thin layer chromatography (TLC). Antimicrobial activity includes isolation of pathogens from clinical samples, its characterization, testing its multiple drug resistance against standard antibiotics and antimicrobial activity of aqueous and alcoholic extracts of both Triphala and Triphala Mashi against these organisms by using agar gel diffusion method. Triphala Mashi containing phenolic compounds, tannins exhibited comparable antimicrobial activity in relation to Triphala against all the microorganisms tested. It inhibits the dose-dependent growth of Gram-positive and Gram-negative bacteria. In conclusion, it appears that Triphala Mashi has non-specific antimicrobial activity.

Biradar, Y. S., R. Singh, A. K. Sharma, K. Dhalwal, S. L. Bodhankar and K. R. Khandelwal (2007). "Evaluation of anti-diarrhoeal property and acute toxicity of Triphala Mashi, an Ayurvedic formulation." Journal of Herbal Pharmacotherapy **7**(3-4): 203-212.

The anti-diarrhoeal effect of aqueous and alcoholic extracts of Triphala and Triphala Mashi were studied employing castor oil-induced-diarrhoeal model in rats. The gastrointestinal transit rate was expressed as the percentage of the longest distance travelled by the charcoal divided by the total length of the small intestine. All the extracts, at various doses 200, 400 and 800 mg/kg displayed remarkable anti-diarrhoeal activity as evidenced by a significant increase in first defecation time, cumulative fecal weight and intestinal transit time. Aqueous and alcoholic extracts of Triphala and Triphala Mashi were considered safe up to a dose of 1750 mg/kg when evaluated for acute oral toxicity in accordance with the OECD (Organization for Economic Co-operation and Development) guidelines. In conclusion, the remarkable anti-diarrhoeal effect of Triphala and Triphala Mashi extracts against castor oil-induced diarrhoea suggest its potential for application in a wide range of diarrhoeal states.

Birla, N. and P. K. Das (2016). "Phytochemical and anticarcinogenic evaluation of triphala powder extract, against melanoma cell line induced skin cancer in rats." Pharmaceutical and Biological Evaluations **3**(3): 366-370.

Objective: Triphala is a botanical preparation consists of Terminalia chebula, Emblica officinalis, Terminalia bellerica and it exhibits a number of health benefits, including antioxidant activity, lowers cholesterol, inhibits HIV, Reduces tumors in animals, protects and improves liver function and many more. Triphala (Harad, Bahada and Amala) in different ratios exhibits a number of health benefits, including: anti-cancerous, antipyretic, antiulcer, antidiabetic activities. Triphala has historically been used as a digestive aid for constipation. Triphala triggered the cancerous cells to die off and significantly reduced the size of the tumours. This study was carried out to evaluate the effect of triphala powder (hydro alcoholic extract) on melanoma skin cancer in rats. Methods: The study was carried out on the melanoma cell line (B6F10) induce model. Results: The powder extract of triphala produced a significant activity in Melanoma cell line-induced skin cancer. Conclusions: Triphala extract increased healing of melanoma skin cancer and prevented the development of experimentally induced skin cancer in rats.

Chahal, J., R. Ohlyan, A. Kandale, A. Walia and S. Puri (2011). "Introduction, Phytochemistry, traditional uses and biological activity of genus Piper: A review." International Journal of Current Pharmaceutical Review and Research **2**(2): 130-144.

Piper, the pepper plants or pepper vines are an economically and ecologically important genus in the family Piperaceae. It contains about 1,000-2,000 species of shrubs, herbs, and lianas, many of which are keystone species in their native habitat. Piper species have a pan tropical distribution, and are most commonly found in the understory of lowland tropical rainforests, but can also occur in clearings and in higher elevation life zones such as cloud forests. Most Piper species are either herbaceous or vines; some grow as shrubs or almost as small trees. Many species of piper have been used for treating different diseases in many traditions. E.g P. cubeba has been used in folk medicine, herbalism as well as in the early 20th century, as a cigarette flavoring. P. darienense is used medically by the Kuna people of the Panama-Colombia border region, and elsewhere it is used to intoxicate fish which then can be easily caught. Black Pepper (P. nigrum) essential oil is sometimes used in herbalism, and Long Pepper (P. longum) is similarly employed in Ayurveda, where it was an ingredient of Triphala Guggulu and (together with Black Pepper) of Trikatu pills, used for rasayana (rejuvenating and detoxifying) purposes.

Chainani, S., S. Siddana, C. V. Reddy, M. Thippeswamy, M. Maurya and S. Rudraswamy (2015). "Antimicrobial activity of Triphala on Lactobacilli and Candida albicans: An in vitro study." Journal of Orofacial Sciences **7**(2): 104-107.

Aim: To determine whether Triphala (Terminalia bellerica, Terminalia chebula, Emblica officinalis) extract has an antimicrobial activity against Lactobacilli and Candida albicans. Materials and Methods: Ethanolic extract of Triphala was prepared by using the cold extraction method. The extract was diluted with an inert solvent, dimethylformamide, to obtain 15 different concentrations of the extract. 0.2% chlorhexidine was used as a positive control and dimethylformamide was used as a negative control. The extract, along with the controls, was subjected to microbiological investigation to determine which concentration among the 15 different concentrations of the extract gave a wider inhibition zone against Lactobacilli and C. albicans. The zones of inhibition were measured in millimeters using a Vernier caliper. Results and Conclusions: Triphala extract demonstrated antimicrobial property against Lactobacilli and C. albicans with maximum zone of inhibition of 22 mm at 6% and 20 mm at 9%.

Chainani, S. H., S. Siddana, C. Reddy, T. H. Manjunathappa, M. Manjunath and S. Rudraswamy (2014). "Antiplaque and antigingivitis efficacy of triphala and chlorhexidine mouthrinse among schoolchildren - a cross-over, double-blind, randomised controlled trial." Oral health & preventive dentistry **12**(3): 209-217.

RESULTS: Triphala and chlorhexidine yielded a significant reduction in plaque and gingival index scores as compared to negative control (P < 0.001). No significant difference was found between the scores obtained with triphala and chlorhexidine mouthwashes. CONCLUSION: The antiplaque and antigingivitis activity of triphala closely parallels that of chlorhexidine. PURPOSE: To evaluate and compare the effect of triphala extract mouthrinse and chlorhexidine on dental plaque and gingivitis. MATERIALS AND METHODS: In this double blind, crossover study, 120 qualifying boarding-school students aged 13-16 years were randomised into three groups: 10% triphala, 0.2% chlorhexidine and negative control. The study was conducted in 3 phases of 1-month duration each and a washout period of 15 days. During the experimental period, subjects rinsed with the allocated mouthrinse once daily for 30 s under supervision. The plaque and gingival status was assessed using the Turesky modification of the Quigley and Hein plaque index (QHI) and the gingival index (Löe and Silness) at baseline and at the end of each phase. The results were tested for significance at P < 0.05.

Chainani, S. H., S. Siddana, C. V. K. Reddy, T. H. Manjunathappa, M. Manjunath and S. Rudraswamy (2014). "Antiplaque and antigingivitis efficacy of triphala and chlorhexidine mouthrinse among schoolchildren - a cross-over, double-blind, randomised controlled trial." Oral Health and Preventive Dentistry **12**(3): 209-217.

Purpose: To evaluate and compare the effect of triphala extract mouthrinse and chlorhexidine on dental plaque and gingivitis. Materials and Methods: In this double blind, crossover study, 120 qualifying boarding-school students aged 13-16 years were randomised into three groups: 10% triphala, 0.1% chlorhexidine and negative control. The study was conducted in 3 phases of 1-month duration each and a washout period of 15 days. During the experimental period, subjects rinsed with the allocated mouthrinse once daily for 30 s under supervision. The plaque and gingival status was assessed using the Turesky modification of the Quigley and Hein plaque index (QHI) and the gingival index (Löe and Silness) at baseline and at the end of each phase. The results were tested for significance at p < 0.05. Results: Triphala and chlorhexidine yielded a significant reduction in plaque and gingival index scores as compared to negative control (p < 0.001). No significant difference was found between the scores obtained with triphala and chlorhexidine mouthwashes. Conclusion: The antiplaque and antigingivitis activity of triphala closely parallels that of chlorhexidine.

Chandel, S. R., V. Kumar, S. Guleria, N. Sharma, A. Sourirajan, P. K. Khosla, D. J. Baumler and K. Dev (2019). "Sequential fractionation by organic solvents enhances the antioxidant and antibacterial activity of ethanolic extracts of fruits and leaves of Terminalia bellerica from North Western Himalayas, India." Pharmacognosy Journal **11**(1): 94-101.

Background: Terminalia bellerica belonging to family combretaceae is one of the major components of “Triphala”, an Ayurvedic formulation. Objective: To evaluate antioxidant potential in the ethanolic extract and its active fraction (chloroform, ethyl acetate, n- butanol and aqueous fraction) from fruits and leaves of Terminalia bellerica. Materials and Methods: Folin-Ciocalteau method and aluminium chloride method was used to quantify total phenolic and flavonoid content respectively in ethanolic extract and their fractions from fruits and leaves of T. bellerica. The antioxidant activity was evaluated using total antioxidant activity, DPPH, FRAP and total antioxidant activity methods. Results: Total phenolics (254.72±3.03 mg/g GAE and 227.52±1.38 mg/g GAE) and flavonoids (64.77±1.24 mg/gm RE and 75.57±1.38 mg/gm RE) content was higher in ethyl acetate fraction of both fruits and leaves sample of T. bellerica, respectively. The order of free radical scavenging activities was ethyl acetate fraction > crude ethanolic extract > n-butanol fraction > chloroform fraction > aqueous fraction. Similarly, ethyl acetate fraction of both fruits and leaves exhibited more antimicrobial activity as compared to that of ethanolic extract as revealed from agar well diffusion method with diameter of zone of inhibi¬tion of 14.0±1.41 mm, 21.0±1.41 mm, 14.0±1.41 mm, 14.5±0.71 mm in fruits and 18.0±1.41 mm, 22.5±2.12 mm, 15.5±2.12 mm, 14.5±3.53 mm in leaves against B. subtilis, S. aureus, E. coli, K. pneumoniae, respectively. MIC values for fruits were 3.125 mg/ml, 0.375 mg/ml, 3.125 mg/ml, 3.125 mg/ml and for leaves were 1.5625 mg/ml, 0.19 mg/ml, 0.78 mg/ml, 0.78 mg/ml against B. subtilis, S. aureus, E. coli, K. pneumoniae, respectively. Conclusion: The present study provides the evidence for comparative antioxidant and antibacterial potential of ethanolic extracts of fruits and leaves of T. bellerica. . Moreover, leaves can be promoted to be used for therapeutics and natural antioxidants.

Chandrakumar, A., A. Xavier, A. Xavier, A. Manakkadiyil, A. Reghu and L. Thomas (2016). "Implications of traditional medicine in the treatment of Hepatitis A in Kerala." Journal of Traditional and Complementary Medicine.

Introduction: The recent outbreaks of Hepatitis A in Kerala are suggestive of decrease in endemicity as most adults were not exposed during the childhood. In allopathic system of medicine, there is no established treatment for Hepatitis A and hence most people tend to rely on the alternate systems of medicine. The study was aimed at identifying the burden of Hepatitis A in the locality and to uncover the degree of dependence of the people on traditional systems of medicine. Methods: The study spanned over 7 months and was conducted in Malappuram district of Kerala. A simple questionnaire having closed-ended questions was prepared and circulated among the physicians in the area. Demographic and other relevant details were obtained from the patients and the medicine system relied on was scrutinized. Results: Of the 348 patients enrolled, majority of the patients were between the age of 10-30 years. The study revealed that females were more affected than males. Similarly people in rural areas were greater than those from urban areas. Most patients (73.28%) relied on Ayurvedic treatment after one week of onset of symptoms. Discussion and conclusion: The preparations such as triphala which has great efficacy in treatment has to be further studied to establish the pathways and mechanism through which it acts. A collaborative effort between government, modern medicine and alternate medicine system can be highly effective in reducing the outbreaks of such epidemics through proper preventive and therapeutic strategies.

Chandran, U., N. Mehendale, G. Tillu and B. Patwardhan (2015). "Network pharmacology of ayurveda formulation triphala with special reference to anti-cancer property." Combinatorial Chemistry and High Throughput Screening **18**(9): 846-854.

Network pharmacology is an emerging technique, which integrates systems biology and computational biology to study multi-component and multi-Targeted formulations. Ayurveda, the traditional system of Indian medicine, uses intelligent formulations; however, their scientific rationale and mechanisms remain largely unexplored. This paper presents the potential of network pharmacology to understand the rationale of a commonly used Ayurveda formulation known as Triphala. We have developed pharmacology networks of Triphala based on the information gathered from different databases and using the software Cytoscape. The networks depict the interaction of bioactives with molecular targets and their relation with diseases, especially cancer. The network pharmacology analysis of Triphala has offered new relationships among bioactives, targets and putative applications of cancer etiology. This pioneering effort might open new possibilities to know pharmacodynamics of Ayurvedic drugs like Triphala and also help in the discovery of new leads and targets for various diseases.

Chandran, U., N. Mehendale, G. Tillu and B. Patwardhan (2015). "Network pharmacology: An emerging technique for natural product drug discovery and scientific research on ayurveda." Proceedings of the Indian National Science Academy **81**(3): 561-568.

Natural products from traditional medicine like Ayurveda are considered as attractive options in new drug discovery. Traditional poly herbal formulations contain many bioactives and are capable of modulating several disease targets. Studying complex relationships between the bioactives, targets, diseases and genes is now possible with help of emerging technique known as network pharmacology. This article briefly explains present status of drug research and highlights importance of network pharmacology as a new tool for drug and formulation discovery. Already, network pharmacology has been successfully used to study traditional Chinese medicines. With help of Ayurvedic formulation Triphala, this article demonstrates how pharmacology networks of medicinal plants and their formulations can be constructed and used to understand putative actions, indications and mechanisms. The emerging technique of network pharmacology can serve as a valuable tool for scientific understanding of Ayurveda and natural product drug discovery.

Chaudhari, V., M. Rajagopala, S. Mistry and D. Vaghela (2010). "Role of Pradhamana Nasya and Trayodashanga Kwatha in the management of Dushta Pratishyaya with special reference to chronic sinusitis." AYU (An international quarterly journal of research in Ayurveda) **31**(3): 325-331.

Dushta Pratishyaya is the chronic stage of Pratishyaya, which occurs due to neglect or improper management of the disease Pratishyaya. In modern science, chronic sinusitis can be correlated with Dushta Pratishyaya on the basis of the signs, symptoms, complications, and prognosis. Changing lifestyles, rapid urbanization, and the increase in cases of antibiotic resistance are responsible for the rise in the prevalence of sinusitis. In the present clinical study, 37 patients were registered and were randomly divided into three groups: A, B, and C; of the 37 patients, 31 completed the full course of treatment. In group A, Trayodashanga Kwatha with Madhu was given orally; in group B, Pradhamana Nasya with Trikatu + Triphala

Churna was administered; and in group C (combined group), Pradhamana Nasya was administered initially, followed by oral Trayodashanga Kwatha with Madhu. In group A, complete relief was observed in 10% of the patients; in group B, marked improvement was observed in 81.82% of patients; and in group C, marked relief was observed in 60% of patients. In comparison to other groups (Group A and Group B), Group C showed percentage wise better results in most of the symptoms.

Chaudhari, V., M. Rajagopala, S. Mistry and D. Vaghela (2010). "Role of Pradhamana Nasya and Trayodashanga Kwatha in the management of Dushta Pratishyaya with special reference to chronic sinusitis." AYU **31**(3): 325-331.

Dushta Pratishyaya is the chronic stage of Pratishyaya, which occurs due to neglect or improper management of the disease Pratishyaya. In modern science, chronic sinusitis can be correlated with Dushta Pratishyaya on the basis of the signs, symptoms, complications, and prognosis. Changing lifestyles, rapid urbanization, and the increase in cases of antibiotic resistance are responsible for the rise in the prevalence of sinusitis. In the present clinical study, 37 patients were registered and were randomly divided into three groups: A, B, and C; of the 37 patients, 31 completed the full course of treatment. In group A, Trayodashanga Kwatha with Madhu was given orally; in group B, Pradhamana Nasya with Trikatu + Triphala Churna was administered; and in group C (combined group), Pradhamana Nasya was administered initially, followed by oral Trayodashanga Kwatha with Madhu. In group A, complete relief was observed in 10% of the patients; in group B, marked improvement was observed in 81.82% of patients; and in group C, marked relief was observed in 60% of patients. In comparison to other groups (Group A and Group B), Group C showed percentage wise better results in most of the symptoms.

Chaudhary, S. K., P. K. Mukherjee, N. K. Nema, S. Bhadra and B. P. Saha (2012). "ACE inhibiton activity of standardized extract and fractions of Terminalia bellerica." Oriental Pharmacy and Experimental Medicine **12**(4): 273-277.

The fruit of Terminalia bellerica L. (Combretaceae) is an important ingredient of 'Triphala', which is a popular Ayurvedic formulation traditionally used to treat hypertension, to reduce cardiac depression and to decreases the risk factors associated with the heart. This study aimed to investigate the angiotensin converting enzyme (ACE) inhibitory activity of T. bellerica. Standardized hydro alcoholic extract (TBHA) and its various subfractions including hexane fraction (TBH), ethyl acetate fraction (TBE), nbutanol fraction (TBB) and aqueous fraction (TBW) at the concentration of 10-1000 µg/ml together with standard Captopril 3.6 ng/ml was compared. TBE fraction was undertaken to isolate the gallic acid. Further quantification of gallic acid in the crude extract and fractions was made with HPLC. Among all fractions the activity was found to be maximum in TBE with an IC50=338.54±18.34 µg/ml while crude TBHA and other fractions TBB, TBH and TBW were found less potent. Isolated gallic acid from the TBE fraction shown ACE inhibitory activity with IC50 of 257.29± 9.39 µg/ml. TBE found to contain maximum amount of gallic acid (71.05±6.274 mg/g of extract). The presence of gallic acid along with other metabolites in the extract and fractions might be responsible for the ACE inhibitory activity. T. bellerica extract/fractions suggested its suitability as a functional food for pharmaceutical purpose to be used against hypertension and other related diseases.

Chaudhary, V. and R. Rohila (2015). "Evaluation of an Ayurvedic formulation in the management of essential hypertension in elderly patients." International Journal of Ayurveda and Pharma Research **3**(1): 72-77.

Introduction: Hypertension is emerging as a pandemic in the society. Though a lot of potent antihypertensive drugs are available today but none of them is free from untoward effects. Especially the elderly population poorly tolerates these drugs. Objective: This study was conducted to clinically evaluate the efficacy of an Ayurvedic formulation in the management of essential hypertension in elderly patients. Materials and Methods: 45 patients of either sex of stage-I essential hypertension in the age group of 60-90 years were registered for the present study. Patients with stage-II hypertension, and secondary hypertension were excluded from study. Registered patients were randomly divided into two groups. In group-I patients were managed with Tagar Churna, Gokshur Churna and Triphla Churna. Group-II patients were managed with a standard calcium channel blocker drug Amlodipine. The duration of trial was 30 days. Observations: After one month of therapy statistically highly significant reduction in systolic B.P., diastolic B.P. mean arterial B.P. and pulse pressure was observed in both groups. Pulse rate was statistically significantly reduced in group-I patients. Biochemical studies revealed a beneficial effect on serum lipid profile in group-I patients whereas in group-II patients it remained unchanged. Conclusion: It is evident from results of the study that combination of Tagar and Gokshura along with Triphala Churna possess potent antihypertensive activity. Combination of trial herbs appear to be safe for elderly hypertensive patients when given in mentioned doses and duration as no untoward effect of therapy was observed during the study period.

Chawre, S. V. and V. E. Gogate (2013). "Randomised study on effect of nishottar choorna and triphala kwath in bahupitta kamla wsr to hepatocellular jaundice." International Journal of Ayurvedic Medicine **4**(3): 203-208.

INTRODUCTION:- Hepatocellular Jaundice is an infectious disease affect the liver. Presenting features of hepatitis are Jaundice, Abdominal Pain, Nausea, Anorexia and Fatigue. As per modern medicine does not have any efficient remedy and due to side effects of available medicine, everybody is in search of alternative medicine. While examining patients in our OPD it was found that many patients were suffering from jaundice, mostly Bahupitta Kamla (Hepatocellular Jaundice). So to find effective and cheaper remedy for patient, this topic was selected. AIM:- To study the efficacy of Nishottar Choorna + Triphala kwatha in Bahupitta Kamla w.s.r. Hepatocellular Jaundice. OBJECTIVE:- 1) To observe the effect of Nishottar Choorna + Triphala kwatha in Bahupitta kamla. 2) To provide efficient and easily available treatment for bahupitta kamla (hepatocellular jaundice). MATERIALS AND METHODS:- 1) Patients suffering from Bahupitta Kamla i.e.Hepatocellular Jaundice were selected from O.P.D. and I.P.D. of GAC,Nanded. 2) 15 patients of Hepatocellular Jaundice i.e. Bahupitta Kamla were selected randomly and Nishottar Choorna 5gm + Triphala kwath 40 ml in BD dose was given. STATISTICAL ANALYSIS AND DISCUSSION:- Statistical analysis and discussions about result will be discussed in detail in paper. RESULT:- The results were encouraging. The therapy provided marked relief from all symptoms of bahupitta kamala and improvement in the liver function tests significantly. CONCLUSION:- Nishottar Choorna and Triphala Kwath was usefull in Bahupitta kamala (Hepatocellular Jaundice) which was also statistically significant. The therapy is cost effective and easily available. Key words: Bahupitta Kamala, Hepatocellular Jaundice,Nishottar Choorna, Triphala Kwath

Cheriyamundath, S., T. Mahaddalkar, S. N. Save, S. Choudhary, R. V. Hosur and M. Lopus (2018). "Aqueous extract of Triphala inhibits cancer cell proliferation through perturbation of microtubule assembly dynamics." Biomedicine and Pharmacotherapy **98**: 76-81.

Triphala (Trl) is an ayurvedic formulation used for treating disorders of the digestive, respiratory, and nervous systems. Its anticancer properties have also been documented. We studied effects of Trl on tubulin, a target protein for several anticancer drugs, and systematically elucidated a possible antiproliferative mechanism of action of Trl. Trl inhibited proliferation of HeLa (cervical adenocarcinoma), PANC-1 (pancreatic adenocarcinoma), and MDA-MB-231 (triple-negative breast carcinoma) cells in microgram quantities and strongly suppressed the clonogenicity of HeLa cells. The formulation disrupted secondary conformation of tubulin and inhibited anilino naphthalene sulfonate binding to tubulin. In cells, Trl-tubulin interactions were manifested as a perturbed microtubule network. Acetylation pattern of Trl-treated cellular microtubules indicated persistent stabilization of microtubule dynamics. In addition, Trl interfered with reassembly of the microtubules. Cells treated with Trl eventually underwent programmed cell death as evidenced by annexin-V staining. Our study shows that the effect of aqueous extract of Trl is potent enough to interfere with the assembly dynamics of microtubules, and that Trl can be investigated further for its antitumor potential.

Choudhary, E., K. R. Indushekar, B. G. Saraf, N. Sheoran, D. Sardana and A. Shekhar (2018). "Exploring the role of Morinda citrifolia and Triphala juice in root canal irrigation: An ex vivo study." Journal of Conservative Dentistry **21**(4): 443-449.

Background: The present ex vivo study explores the role of Indian medicaments in endodontic irrigation in an attempt to search for a safe alternative to sodium hypochlorite (NaOCL). Aim: To evaluate the efficacy of commercial preparations of Morinda citrifolia juice (MCJ) and Triphala juice against Enterococcus faecalis and Candida albicans. Materials and Methods: The study was conducted on 84 permanent extracted human teeth. After decoronation and biomechanical preparation, inoculated (with E. faecalis and C. albicans) root sections were divided randomly into four experimental (MCJ, Triphala juice, 1% NaOCl, and 2% chlorhexidine [CHX]) and two control groups (preservative control and distilled water). Colony-forming units (CFUs) obtained for each group were counted at baseline (S0) and after irrigation at 1 and 3 days (S1and S2, respectively). Mean of Log CFU at S0, S1, and S2was compared for each irrigant using Friedman's two-way ANOVA. Results: There was a significant decrease in microbial counts of both microbes in all groups at S1, but only CHX could demonstrate further decrease in the microbial counts of both microorganisms at S2. Conclusion: The overall antimicrobial effects of different irrigants were maximum for CHX, whereas MCJ and Triphala juice also showed significant reductions. The herbal irrigants hold the promise of becoming efficient irrigants and warrant further research.

Chouhan, B., R. C. Kumawat, M. Kotecha, A. Ramamurthy and S. Nathani (2013). "Triphala: A comprehensive ayurvedic review." International Journal of Research in Ayurveda and Pharmacy **4**(4): 612-617.

Triphala is used in the traditional Indian system of medicine. The fruit of three together is called Triphala and vara, phalatrikam, sresthatamam are its synonyms. It is an antioxidant-rich herbal formulation and possesses diverse beneficial properties. It is a widely prescribed Ayurvedic drug and is used in the ailments of all dosas, stimulates digestive capacity, rasayana and vrisya etc. It is a polyherbal compound. It is necessary to corroborate the consistency of mixing or combining in attribute balance. As per Ayurvedic Formulary of India (AFI) it is prepared by combining a 1:1:1 mixing of ground dry fruits, called as myrobalans. It shows immunomodulatory properties and helps in improving the body's defense system. In recent years there are several studies which suggest that Triphala possesses anti-mutagenic, radio protecting and antioxidant activity and beneficial in diseases conditions.

Chulet, R. and P. Pradhan (2009). "A review on rasayana." Pharmacognosy Reviews **3**(6): 229-234.

Rasayana is one of the eight clinical specialities of classical Ayurveda. Rasayana replenish the vital fluids of our body, thus keeping us away from diseases. The rasayana therapy enhance the qualities of rasa, enriches it with nutrients so one can attains longevity, memory, intelligence, freedom from disorder, youthfulness, excellence of luster, complexion and voice, optimum development of physique and sense organs, mastery over phonetics and brilliance. Taking rasayana is helpful to increase the immunity of the person to keep him away from disease and also reverses the disease process and prevents the re-occurrence. The Rasayanas are rejuvenators, nutritional supplements and possess strong antioxidant activity. They also have antagonistic actions on the oxidative stressors, which give rise to the formation of different free radicals. Ocimum sanctum, Tinospora cordifolia, Emblica officinalis, Convolvulus pluricaulis, Centella asiatica, Bacopa monniera, Withania somnifera, Triphala rasayana, Chyawanprash, Brahma rasayana are very important rasayanas which are described in ayurveda and proved by new researches.

Dash, G. K., R. Muthukumarsamy, S. Majeed and A. Mathews (2019). "Quantitative estimation of gallic acid in Triphala churna by HPTLC." Journal of Global Pharma Technology **11**(3): 7-11.

A simple, reliable and rapid HPTLC method was developed for qquantitative estimation of gallic acid in the methanol extract of Triphala churna. The method was validated as per ICH guidelines for linearity, accuracy, precision, and specificity. Silica gel 60 F254 pre-coated aluminium plates were used as the stationary phase. Toluene: Ethyl acetate: Formic acid: Methanol (12: 9: 4: 0.5) constituted the mobile phase. Percentage of gallic acid was estimated through densitometry scanning using a TLC Scanner III (Camag, Switzerland) with winCATS software. The amount of gallic acid present in the sample was found to be 0.41 ± 0.08 % w/w with respect to dried plant material. Thus, the developed method can be applied in quantifying the amounts of gallic acid in Triphala churna and results of this work will support in the standardization process of Triphala churna using gallic acid as the biomarker.

Deep, G., M. Dhiman, A. R. Rao and R. K. Kale (2005). "Chemopreventive potential of Triphala (a composite Indian rug) on benzo(a)pyrene induced forestomach tumorigenesis in murine tumor model system." Journal of Experimental and Clinical Cancer Research **24**(4): 555-563.

The present work is probably the first report on cancer chemopreventive potential of Triphala, a combination of fruit powder of three different plants namely Terminalia chebula, Terminalia belerica and Emblica officinalis. Triphala is a popular formulation of the Ayurvedic system of medicine. Our findings have shown that Triphala in diet has significantly reduced the benzo(a)pyrene [B(a)P] induced forestomach papillomagenesis in mice. In the short term treatment groups, the tumor incidences were lowered to 77.77% by both doses of Triphala mixed diet. In the case of long term treatment the tumor incidences were reduced to 66.66% and 62.50% respectively by 2.5% and 5% triphala containing diet. Tumor burden was 7.27±1.16 in the B(a)P treated control group, whereas it reduced to 3.00±0.82 ($p<0.005$) by 2.5% dose and 2.33±1.03 ($p<0.001$) by 5% dose of Triphala. In long-term studies the tumor burden was reduced to 2.17±0.75 ($p<0.001$) and 2.00±0.71 ($p<0.001$) by 2.5% and 5% diet of Triphala, respectively. It was important to observe that Triphala was more effective in reducing tumor incidences compared to its individual constituents. Triphala also significantly increased the antioxidant status of animals which might have contributed to the chemoprevention. It was inferred that the concomitant use of multiple agents seemed to have a high degree of chemoprevention potential.

Denni, M., B. Sandhya and S. Ramesh (2012). "An investigation to variation in constituents in the fruits of terminalia chebula retz. At different maturity stages." International Journal of Pharma and Bio Sciences **3**(1): P416-P419.

Fruits of Terminalia chebula Retz., or the chebulic myrobalan, hold an important place in Ayurveda, as an important constituent of Triphala. They are harvested at three different stages of maturity and are thus

available in the market as three different varieties. The most mature fruit is referred to as Surwary harda and the intermediately mature fruit is referred to as Rangari harda. The least mature fruit is commonly referred to as Bal harda. In the present work the variation in constituents of these products is followed up. Harda is known for its tannin content, especially gallic and ellagic acid derivatives. Gallic acid was found only in the mature fruits, while ellagic acid was found in both young and intermediate fruits. Two methyl ether derivatives of quercetin i.e. 3'-Methoxy quercetin and 3', 4'-Dimethoxy quercetin, were identified in all the three fruits, whose contents were found to increase with maturity. Melilotic acid has been identified along with vanillic and p-coumaric acids. All the three phenolic acids were found present only in intermediate and mature fruits. Pro-pelargonidin has been isolated from the mature fruit, using paper chromatography and identified using spectral analysis. Quinones were found to be absent in the young fruit.

Desai, A., M. Anil and S. Debnath (2010). "A clinical trial to evaluate the effects of triphala as a mouthwash in comparison with chlorhexidine in chronic generalised periodontitis patient." Indian Journal of Dental Advancements **2**(3): 243-248.

Ayurvedic drugs have been used since ancient times; oral rinses made from these are used in periodontal therapy. Triphala is one of these with wide spectrum of activity. Chlorhexidine is a bisguanide antiseptic, a potent antibacterial and anti plaque agent. 24 patients with chronic generalised periodontitis were recruited for the study and divided into three groups, group A patients treated with scaling and root planning, group B with SRP and prescribed to use Triphala as a mouthwash, group C-SRP and prescribed to use Chlorhexidine mouthwash. Patients were monitored for a period of 45 days. Triphala as a mouthwash showed significant reduction in periodontal indices when compared to SRP alone but no significant difference was noted between Triphala and Chlorhexidine group. Key words: Periodontitis, Mouth wash, triphala, chlorhexidine.

Desai, A. and M. Savardekar (2011). "Ayurvedic formulation "Triphala churna": A monograph." Indian Drugs **48**(12): 14-19.

"Triphala churna" is one of the easily available Ayurvedic formulations sold as OTC drug, used for constipation as home remedy. It is a powdered preparation made with fruit pericarp of three ingredients, Emblica officinalis Gaertn. (Amala), Terminalia belerica Roxb. (Behada), Terminalia chebula Retz. (Hirda) in equal proportion. In the present study the raw material was procured from commercial supplier, identified botanically & complied as per Ayurvedic Pharmacopoeia of India. Triphala churna was prepared as per Ayurvedic Formulary of India (in-house sample). It was tested as per pharmacopoeial guidelines. Parameters such as organoleptic characters, microscopic characters, physico-chemical parameters, TLC studies using gallic acid as an active phytomarker, estimation of total tannins, heavy metals limit test, presence of aflatoxins (B1, G1, B2 & G2) were studied. Simultaneously, market samples of Triphala churna were procured over the counter for comparison. So main objective of this study is to prepare the monograph for "Triphala churna".

Desai, A. and M. Savardekar (2012). "Stability study of triphala Churna." Indian Drugs **49**(5): 56-60.

Triphala Churna is an Ayurvedic preparation, prepared by mechanical mixing of three fruit pericarp powders, Emblica officinalis Gaertn., Terminalia belerica Roxb. and Terminalia chebula Retz. It is sold in the market as over the counter drug and mainly used for constipation problems. The raw material was collected from the market, after confirming the appropriate time of collection, to get the fresh material. Triphala Churna was prepared as per the Ayurvedic Formulary of India, under the supervision of an Ayurvedic manufacturer. In the present study the stability of the preparation was studied as per ICH guidelines. The samples were incubated in stability chamber for accelerated studies (A) and long term studies (L). One set of samples was kept at ambient temperature and humidity for real time study (R). The samples were intermittently re-tested for organoleptic characters, physicochemical parameters and assay of the total tannins. It was observed that the results go along with the standard Ayurvedic text. The preparation has very short life when assessed on the basis of total tannins.

Deshpande, A., S. Tandon and N. Deshpande (2014). "Low resource screening method of pre-cancerous lesions and its reversal by Triphala in teen-age Indian population." AYU (An international quarterly journal of research in Ayurveda) **35**(2): 160-167.

Cancer screening is the main weapon for early detection at a pre-invasive or premalignant stage. It has been reported that over 12 million people use some form of tobacco, which is one of the high risk factors and has hence become an alarming world-wide problem. Aim: To evaluate the effective diagnostic

screening of disease in its early stage by inexpensive method and also to evaluate the effect of indigenous mouthrinse on reversal of pre-cancerous lesions. Materials and Methods: The screening for teenagers belonging to low socio-economic status was carried out. Suspected subjects were evaluated for the reversal of the lesions by use of Ayurvedic preparation as a mouthwash. From 13 to19 years working-child population of North India was selected for the study. Screening was performed by new method-visual inspection with acetic acid. The positive subjects were further investigated by pap smear and biopsy was done as a confirmatory histopathological report. In second phase, the subjects showing positive lesions were advised indigenous anti-cancer mouth rinse and its effect was evaluated after 6 month and 9 month of prescribing the rinse. Results: The total 1095 children were screened (831 boys and 264 girls). Out of total 34 teenager boys were diagnosed, as acetowhite positive lesion. All the acetowhite positive lesions were found exclusively in males. Histological findings after 9 month use of Triphala mouth rinse revealed no changes in cells in 23 (85.2%), hyperkeratinization in 2 (7.4%), hyperkeratinization and spongiosis was evident in 1 (3.7%), mild pleomorphism in 1 (3.7%) patient. Comparative evaluation from 0-9 month showed statistically highly significant test ($P < 0.01$). Conclusion: Use of different forms of tobacco and betel nut showed convincing relationship between developments of oral pre-cancerous lesions. Triphala was found to have great potential for reversal of these lesions.

Deswal, H., Y. Singh, H. S. Grover and A. Bhardwaj (2016). "Curative Effect of Triphala in Medical and Dental Sciences: A Scientific Review." Innovare Journal of Health Sciences **4**(2): 1-4.

Advances in the field of alternative medicine have promoted the use of various natural products. Conventional drugs usually provide effective antibiotic therapy for bacterial infections, but there is an increasing problem of antibiotic resistance and a continuing need for new inventions. Hence, herbal drugs are being preferred over synthetic antibiotics. Triphala is such product which has innumerable benefits in the field of medicine which has procured appreciable importance in clinical research. It consists of equal parts of the Emblica officinalis, Terminalia chebula, and Terminalia bellerica. It is an antioxidant-rich herbal formulation and possesses diverse beneficial properties. It is a widely prescribed Ayurvedic drug and is used in the ailments of all dosas. It is a polyherbal compound. It is necessary to corroborate the consistency of mixing or combining in attribute balance. The present review will focus on the comprehensive appraisal of Triphala and its several applications in medicine and dentistry.

Dhanalakshmi, S., R. S. Devi, R. Srikumar, S. Manikandan and R. Thangaraj (2007). "Protective effect of triphala on cold stress-induced behavioral and biochemical abnormalities in rats." Yakugaku Zasshi **127**(11): 1863-1867.

Stress is one of the basic factors in the etiology of number of diseases. Cold-stress occurs when the surrounding temperature drops below 18°C, the body may not be able to warm itself, and hence serious cold-related illnesses, permanent tissue damage and death may results. The present study was aimed to investigate the effect of Triphala (Terminalia chebula, Terminalia belerica and Emblica officinalis) against the cold stress-induced alterations in the behavioral and biochemical abnormalities in four different groups (saline control, Triphala, cold-stress and Triphala with cold-stress) of Wistar strain albino rats. In this study cold-stress (8°C for 16 h/d/15 days) was applied and the oxidative stress was assessed by measuring the extent of lipid peroxidation (LPO) and the changes in corticosterone levels. Upon exposure to the cold-stress, a significant ($P<0.05$) increase in immobilization with decrease in rearing, grooming, and ambulation behavior was seen in open field. Following cold-exposure, significant increase in the LPO and corticosterone levels was observed. Oral administration of Triphala (1 g/kg/animal body weight) for 48 days significantly prevented these cold stress-induced behavioral and biochemical abnormalities in albino rats. The results of this study suggest that Triphala supplementation can be regarded as a protective drug against stress.

Dhanalakshmi, S., R. Srikumar, S. Manikandan, N. J. Parthasarathy and R. S. Devi (2006). "Antioxidant property of triphala on cold stress induced oxidative stress in experimental rats." Journal of Health Science **52**(6): 843-847.

Stress is one of the basic factors in the etiology of number of diseases. The present study was aimed to investigate the antioxidant properties of Triphala (Terminalia chebula, Terminalia bellerica and Emblica officinalis) during cold-stress. Four groups of albino rats were employed namely control, Triphala, coldstress and Triphala with cold-stress. The oxidative stress was assessed by measuring the lipid peroxidation (LPO), enzymatic superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx) and non-enzymatic (Vitamin C) antioxidant status in adrenal tissue and plasma corticosterone level. Following coldexposure (8°C for 16 hr/d/15 days), enzymatic and non-enzymatic antioxidants were significantly reduced with concomitant increase in LPO and corticosterone levels were observed. Administration of Triphala (1 g/kg/ body weight/48 days) significantly prevents the cold-stress-induced

oxidative stress and elevation in LPO and corticosterone levels. This study concludes that Triphala supplementation significantly prevents the cold-stress-induced oxidative stress may due to its antioxidant properties.

Dhiman, K. S., R. Agarwal, G. Gopinathan and V. J. Shukla (2017). "Optimization of Parisheka kriyakalpa (Procedure for closed eye irrigation) 3: A clinical study on acute conjunctivitis with Triphala decoction." Indian Journal of Traditional Knowledge **16**(1): 107-112.

Scientific validation of any drug, therapy, protocol or procedure requires a standardized procedure of manufacturing process, execution of the protocol or therapeutic procedure for standardization if the formulation protocol or procedure has variables in literature and practice; they need to be optimized first following a systematic approach with prospective clinical application for further validation of the optimized data. Netra Parisheka/Seka foremost topical ocular therapeutic procedure had similar prevalence of variability in literature and practice. To meet the above criteria and to achieve the objective of standardization; optimization of SOP of Netra Parisheka procedure was thought to be the pre-requisite. Using all adopted parameters, total 51 (68 eyes) patients were enrolled out of which 50 (67 eyes) patients completed the study. Highly significant result with P value > 0.001 of Netra Parisheka procedure for a period of four days in dose of 750 ml, 500 ml & 250 ml for Vata, Pitta & Kaphaja Netra roga, respectively, temperature 37.2–37.7 oC, height 6-6.5 cm, duration 5–15 min, width 1.5-2.0 mm in Aamavastha of Netra roga (acute inflammatory condition of the eye) and shows its definite role of the procedure in the conversion of Aamavastha to Niraamavastha (remission of acute inflammatory sign) after 4th day. In some cases complete remission of symptoms was observed, i.e., 40%, while more than 70 % patients were having improvement in their signs and symptoms.

Divia, A. R., M. G. Nair, J. M. Varughese and S. Kurien (2018). "A comparative evaluation of Morinda citrifolia, green tea polyphenols, and Triphala with 5% sodium hypochlorite as an endodontic irrigant against Enterococcus faecalis: An in vitro study." Dental Research Journal **15**(2): 117-122.

Background: Endodontic infections require effective removal of microorganisms from the root canal system for long-term prognosis. Sodium hypochlorite (NaOCl) is the most effective irrigant currently, but potential complications due to its toxicity warrant search for newer alternatives. In this study, the antimicrobial efficacy of Morinda citrifolia (MC), green tea polyphenols and Triphala was compared with 5% NaOCl against Enterococcus faecalis. Materials and Methods: In this in vitro study sixty extracted human premolar teeth were infected with E. faecalis, a Group D Streptococci for 48 h. At the end of 48 h, the vital bacterial population was assessed by counting the number of colony-forming units (CFUs) on blood agar plate. Samples were divided into five groups; Group I (distilled water), Group II (NaOCl), Group III (MC), Group IV (Triphala), and Group V (green tea polyphenols). The samples were irrigated with individual test agents and CFUs were recorded. Kruskal-Wallis test was performed as the parametric test to compare different groups. Student's t-test was used to compare mean values between groups before and after treatment with test agents ($P < 0.001$). Results: NaOCl was the most effective irrigant the elimination of E. faecalis reinforcing its role as the best irrigant available currently and a gold standard for comparison of the experimental groups. Its antibacterial effect was comparable to Triphala. Among the experimental groups, MC showed the minimum antibacterial effect. Conclusion: The use of herbal alternatives as a root canal irrigant might prove to be advantageous considering the several undesirable characteristics of NaOCl.

Dnyaneshwar, W., C. Preeti, J. Kalpana and P. Bhushan (2006). "Development and application of RAPD-SCAR marker for identification of Phyllanthus emblica Linn." Biological and Pharmaceutical Bulletin **29**(11): 2313-2316.

Correct genotype identification of medicinal plant material remains important for botanical drug industry. Limitations of chemical and morphological approaches for authentication have generated need for newer methods in quality control of botanicals. The present study was carried out to develop DNA based marker for identification of Phyllanthus emblica LINN. A putative marker (1.1 kb) specific for P. emblica was identified by Random Amplified Polymorphic DNA (RAPD) technique. Sequence Characterized Amplified Region (SCAR) marker was developed from the RAPD amplicon. The SCAR marker was found useful for identification of P. emblica in its commercial samples and Triphalachurna, a multi-component Ayurvedic formulation.

Emtiazy, M., E. Zareie, L. Shirbeigi, O. Sadeghpour and P. Mansouri (2018). "Effect of oral herbal medicament on scalp seborrhea and gastrointestinal symptoms in a male patient: A case report." Iranian Journal of Public Health **47**(7): 1030-1033.

A 32-yr-old man with a 10-yr history of scalp seborrhea referred to Skin and Stem Cell Research Center, Tehran, Iran, in 2015. He suffered from scalp seborrhea. Concurrent gastrointestinal symptoms and the changes in the clinical symptoms after consumption of the polyherbal traditional drug called Triphala are discussed. The scalp sebum was measured with a Sebumeter SM815. Gastrointestinal symptoms were followed using a valid questionnaire. After two months of treatment, scalp sebum secretion had decreased substantially. The patient also experienced remarkable improvement in gastrointestinal symptoms. Considering the positive effect of this known and safe polyherbal drug on skin sebum, it is an appropriate option for detailed large-scale clinical trials.

Eugin Amala, V. and M. Jeyaraj (2014). "Determination of antibacterial, Antifungal, Bioactive constituents of triphala by FT-IR and GC-MS analysis." International Journal of Pharmacy and Pharmaceutical Sciences **6**(8): 123-126.

Objectives: To characterize the number of phytoconstituents present in triphala using FT-IR and GC-MS. Methods: Antibacterial activity was measured by disc diffusion method, antifungal activity were analyzed by poisoned food technique, organic analysis was done by FT-IR, phytocomponents were identified by GC-MS analysis. Results: The major bioactive components were present in methanolic extracts, further screened by GC-MS analysis revealed the presence of 10 bioactive compounds. The results were presented that triphala contains richly 1, 2, 3-Benzenetriol, 2-Furancarboxaldehyde, 5-(hydroxymethyl)-, 4H-Pyran-4-one, 2, 3-dihydro-3, 5-dihydroxy-6-methyl-, Furfural, 2H-Pyran-2, 6(3H)-dione, D-Allose, n-Hexadecanoic acid, DL-Proline, 5-oxo-, methyl ester, Undecanol-5, 9-Phenanthrenol Conclusion: Present findings indicated promising antimicrobial and phytocomponents are present and having remarkable number of qualities.

Gaidhani, S. N., A. Singh, S. Kumari, G. S. Lavekar, A. S. Juvekar, S. Sen and M. M. Padhi (2013). "Evaluation of some plant extracts for standardization and anticancer activity." Indian Journal of Traditional Knowledge **12**(4): 682-687.

In recent times, the trend in cancer research is shifting towards identifying new medicines from natural resources for management of cancer. Medicinal plants such as Sthauneyaka (Taxus baccata L.) and compound formulations like Triphala ghrita, Khadirarista, Madhusnuhi rasayana, Maha triphaladya ghrita, Panchatikta guggulu ghrita are indicated in the Ayurvedic texts for management of cancer/ tumour. The anti-proliferative activities of hydro-alcoholic extracts of some standardized plant materials were screened against a panel of 14 human cancer cell lines representing different tissues (lung, pancreas, colon, cervix, oral, bladder, prostate, breast, leukaemia, etc.) through Sulforhodamine-B (SRB) assay. The findings revealed that Cedrus deodara (Roxb.) ex Lamb. and Berberis aristata (Roxb.) ex DC. have maximum anticancer activity against 3 cell lines while Withania somnifera Dunal. showed activity against two cell lines. In addition to these, Picrorhiza kurroa Royle ex Benth. and Piper longum L. were found active against only one cell line. These results indicate the potential of Ayurvedic medicinal herbs as anti-neoplastic agents mentioned in the Ayurvedic texts. However, further studies are needed for evaluating their mechanism of action and to isolate the active anticancer compounds responsible for this activity.

Gaind, K. N., H. C. Mital and S. R. Khanna (1963). "A study on the purgative activity of Triphala." Indian Journal of Physiology and Pharmacology **7**: 172-175.

Ganeshpurkar, A., S. Jain and S. Agarwal (2015). "Experimental studies on glycolytic enzyme inhibitory and antiglycation potential of Triphala." AYU (An international quarterly journal of research in Ayurveda) **36**(1): 96-100.

Introduction: Imbalance in cellular metabolism of carbohydrates and lipids is observed in diabetes mellitus. Pancreatic α-amylase and α-glucosidases are responsible for the conversion of polysaccharides into glucose that enters in the blood stream. Triphala has shown antidiabetic effects (type 2) in human subjects. However, its effects on glycolytic enzymes and protein glycation have not been studied. Aim: To evaluate glycolytic enzyme inhibitory and antiglycation potential of Triphala. Materials and Methods: Triphala Churna was extracted with cold water and subjected to phytochemical analysis. Studies on α amylase and α glucosidase inhibition were performed, and its antiglycation potential was determined. Results: Triphala extract showed prominent α-amylase inhibitory potential (48.66% at concentration 250 µg/ml). Percent α-glucosidase inhibition increased with increasing concentration of the extract (6.32–40.64%). Extract showed remarkable results for antiglycation potential. Triphala extract showed glycation inhibition by inhibiting fructosamine; fructosamine inhibition was found to be 37.74%, protein carbonyls were inhibited up to 15.23% whereas protein thiols were inhibited up to 84.81%. Conclusion: Triphala showed glycolytic enzyme inhibitory and antiglycation potential. Hence, it can be effectively used in the diabetes management.

Gangamma, M., P. and M. Rajagopala (2010). "A clinical study on "Computer vision syndrome" and its management with Triphala eye drops and Saptamrita Lauha." AYU (An international quarterly journal of research in Ayurveda) **31**(2): 236-239.

American Optometric Association (AOA) defines computer vision syndrome (CVS) as "Complex of eye and vision problems related to near work, which are experienced during or related to computer use". Most studies indicate that Video Display Terminal (VDT) operators report more eye related problems than non-VDT office workers. The causes for the inefficiencies and the visual symptoms are a combination of individual visual problems and poor office ergonomics. In this clinical study on "CVS", 151 patients were registered, out of whom 141 completed the treatment. In Group A, 45 patients had been prescribed Triphala eye drops; in Group B, 53 patients had been prescribed the Triphala eye drops and Saptamrita Lauha tablets internally, and in Group C, 43 patients had been prescribed the placebo eye drops and placebo tablets. In total, marked improvement was observed in 48.89, 54.71 and 06.98% patients in groups A, B and C, respectively.

Gautam, A. K., S. Avasthi, A. Sharma and R. Bhadauria (2010). "Efficacy of Triphala Churn ingredients against A. niger and potential of clove extract as herbal fungitoxicant." Biology and Medicine **2**(2): 1-9.

The present study explores the association of Aspergillus niger with stored raw and powdered ingredients of Triphala Churn, which is a 1:1:1 proportional combination of Emblica officinalis Gaertn. (Amla), Terminalia bellerica (Gaertn.) Roxb. (Baheda), and Terminalia chebula Retz. (Harada) respectively. Total 106 stored fruits and 68 powdered samples of E. officinalis, T. bellerica and T. chebula, have been analysed for their fungal association, if any. Results revealed that among all the fungal isolates, A. niger was found to be a frequently occurring species as well as a major contaminant. Therefore, present investigation was carried out to study the efficacy of aqueous extracts of fruits (fresh & dry) and a powdered ingredient of Triphala churn against the growth of A. niger. In addition, an effort has been made to evaluate the antifungal potential of aqueous extracts of Syzygium aromaticum (L.) Merril & Perry (Clove), Cinnamomum zeylanicum Blume (Cinnamon), and Zingiber officinale Roscoe (Ginger) as herbal fungitoxiants, to control the growth of A. niger. During the investigation of samples for fungal contamination, highest percent frequency (93.10%) of A. niger was recorded. It was observed that none of the aqueous extracts of fruits and powdered ingredient of Triphala churn was found effective against the growth of A. niger. However, the aqueous extract of Clove was found strongly effective to inhibit the growth of A. niger completely at 20% concentration (v/v). Among the other extracts Cinnamon showed 24.73% inhibition, whereas Ginger extracts was observed to be ineffective against A. niger. Hence, the aqueous extract of Clove can be utilized as herbal fungitoxicant to control the growth of A. niger.

Gautam, A. K., S. Avasthi, A. Sharma and R. Bhadauria (2012). "Antifungal potential of triphala churna ingredients against Aspergillus species associated with them during storage." Pakistan Journal of Biological Sciences **15**(5): 244-249.

The present study describes the antifungal potential of fruit and powdered ingredents of triphala chuma, ie. Emblica officinalis (Garetn.) (Amla), Teminalia bellirica (Gaem.) Roxb. (Baheda) and Teminalia chebula (Retz.) (Hamda), collected kom the market of Gwalior (M.P.), India. Water extracts of all the fruits and powdered samples were tested (in vitro) for their antifungal activities by poisoned food technique against different Aspergillus species (A.fZavus, A. fumigahrs, A. versicolor, A. terreus and A. niger) associated with them during storage. All extracts displayed varied levels i e vely low to vely high antifungal activities on four Aspergillus species. The aqueous extracts of fresh fruits (37.96+7.59%) was obsenred to be most effective than dry fruits (34.95+7.59%) and powder (25.07+6.05%). Teminalia chebula (fresh and dry) extracts were found most active agaimt the four Aspergillus species with 49.15 and 40.8% inhibition, respectively. None of the extracts were found effective agaimt the growth of A. niger. All fruits and powdered aqueous extracts were obsenred to be ineffective agaimt the A. niger. The variability in antifungal activity of aqueous extracts in the present study may be useful to study the relatiomhp between antifungal potential of herbal dmgs and prevalence of fungal contaminant during their storage.

Gautam, A. K. and R. Bhadauria (2011). "Diversity of fungi and mycotoxins associated with stored Triphala churn and its ingredients." Journal of Biological Sciences **11**(3): 226-235.

The present study explores the mycoflora associated with stored, Triphala churn and its raw material. Total 106 stored fruits and 68 powdered samples have been analysed for their fungal and mycotoxin association, if any. Results revealed that total 21 fungal species belonging to 11 different genera, in which eight species were only from genus Aspergillus, four from Penicillium and single species of each Helminthosporium, Curvularia, Alternaria, Geotrichum, Fusarium, Rhizopus, Paecilomyces and Syncephalastrum was recorded.

About 97.36% of Triphala churn samples, 94.66% dried fruits and 89% powdered samples were found contaminated with various fungi. About 73.68% Triphala churn, 50% fruits and 20.58% powdered samples were found contaminated with six mycotoxins namely, aflatoxin Bl and B2, aflatoxin Gl and G2, citrinin and sterigmatocystin. All the six mycotoxins were detected from the samples of fruits and powder, whereas, five mycotoxins were detected from Triphala churn samples. After PCR analysis of most frequently occurring fungal species with two universal fungal primers ITS-1 and ITS-4, band pattern obtained on agarose gel clearly differentiating the different fungal species. Seven frequently observed species of Aspergillus namely, A. niger, A. terreus, A. fumigatus, A. flavus, A. terreus, A. parasiticus, A. versicolor were tested for their aflatoxigenic nature with omt-l and ver-i gene specific primers and amplification products of 895 and 596 bp were obtained only from A. flavus and A parasiticus which indicate as aflatoxigenic nature. Presence of species of Aspergillus and Penicillium and mycotoxins in Triphala churn and its ingredients could represent a threat to consumer's health.

Gautam, A. K., S. Sharma and R. Bhadauria (2010). "Detection of toxigenic fungi and mycotoxins in medicinally important powdered herbal drugs." Internet Journal of Microbiology **7**(2).

This investigation was designed to through light on the microbial status of some powdered herbal materials used in Triphala preparation. A total of 68 powdered samples Emblica officinalis (Amla), Terminalia belerica (Baheda) and Terminalia chebula (Harada) were collected from random sources in Gwalior market. Mycological analysis of powdered samples was carried out for the detection and enumeration of fungi using standard media. Samples were also investigated from mycotoxilogical point of view to identify mycotoxins associated. Fungal contamination was found in almost 91% of the samples. Aspergillus and Penicillium genera were detected more frequently than other genera i.e. Helminthosporium, Curvularia, Geotrichum, Fusarium, Rhizopus,Paecilomyces. In total, 771 fungal isolates belonging to 14 fungal species and 8 different genera were recorded. Overall, six species of genus Aspergillus and three of genus Penicillium were dominant. In spite of this natural infection of powder samples, only 14 (20.58%) out of 68 samples analyzed were found to be positive for mycotoxins including aflatoxins (B1, B2, G1 and G2), citrinin and sterigmatocystin. Therefore, study concluded that, as herbal drugs seems to be high risk products, thus require designing some more appropriate methods of their decontamination.

Gavhane, A. J., P. Padmanabhan, S. P. Kamble and S. N. Jangle (2012). "Synthesis of silver nanoparticles using extract of neem leaf and triphala and evaluation of their antimicrobial activities." International Journal of Pharma and Bio Sciences **3**(3): P88-P100.

Silver nanoparticles were synthesized using extracts of Neem (Azadirachta indica) leaves and Triphala-a well known herbal mixture, used widely in treatment of various ailments. The characteristics of silver nanoparticles were studied using NTA, TEM and EDX. The EDX spectrum of the silver nanoparticles confirmed the presence of elemental silver signal. NTA measurements showed that the average size of silver nanoparticles synthesized using Neem leaves extract were 43nm and 59nm for silver nanoparticles synthesized by Triphala. TEM analysis showed that the silver nanoparticles were predominantly spherical in nature. It was found that the growth of gentamycin and ampicillin resistant K. pneuomoniae was inhibited by both Neem and Triphala synthesized silver nanoparticles. Similar observations were noted for gentamicin and piperacillin resistant S. typhi. Fluconazole resistant C. albicans were found to be sensitive to silver nanoparticles. Growth of multiple drug resistant E.coli was inhibited by silver nanoparticles and this effect was augmented by synergistic action of gentamycin and the silver nanoparticles synthesized by aqueous extract of Neem and Triphala.

Girdhani, S., S. M. Bhosle, S. A. Thulsidas, A. Kumar and K. P. Mishra (2005). "Potential of radiosensitizing agents in cancer chemo-radiotherapy." Journal of Cancer Research and Therapeutics **1**(3): 129-131.

Potential of herbs and other plant-based formulations have been increasingly recognized in prevention and treatment of human diseases including cancer. There exist enormous prospect for screening and evaluation of herbal/plant products for developing effective radiosensitization and radioprotection relevant to nuclear research program. Investigations in our laboratory have focused on the mechanism of activity of variety of anticancer and antioxidant agents, namely, Eugenol, (EU), Ellagic acid (EA), Triphala (TPL), Tocopherol Succinate (TOS) and Arachidonic acid on normal and cancer cells with view to design effective protocols in practical radioprotection and cancer radiotherapy. This paper is mainly focused on studies on cytotoxic effects on cancer cell lines. Results have shown that these agents produced radiosensitizing action involving oxidative damage, membrane alteration and damage to nucleic acid in various human cell lines. Studies were performed employing fluorescence probes and electron spin

resonance methods and gel electrophoresis protocols. It has been found that cytotoxic effect was induced by initiating membrane oxidative damage and by triggering intracellular generation of reactive oxygen species (ROS) by gamma radiation in combination with phytochemicals like TPL, EA and TOS in tumor cell line Ehrlich Ascites (EAC), Human cervical (HeLa) and breast (MCF-7) cells. Membrane damage and ROS generation was measured by DPH and DCF-FDA fluorescent probes respectively after exposure to low to moderate doses of gamma radiation. This talk will present the cytotoxic effects of phytochemicals in combination with ionizing radiation. It is emphasized that modulation of membrane peroxidative damage and intra cellular ROS may help achieve efficient killing of cancer cells which may provide a new approach to developing effective treatment of cancer.

Gondi, D., M. Koppolu, S. Chinni, A. Lavanya, G. Kiranmayi and T. Leninbabu (2016). "Effect of morinda citrifolia juice and triphala as root canal irrigants on sealer penetration depth into the dentinal tubules.--a confocal laser microscope study." Annals & Essences of Dentistry **7**(2).

Gopala Krishna, H. N., P. Sudhakar, P. Dorababu, M. R. S. M. Pai, N. Colaco and V. Vineetha (2010). "The effect of acute and chronic administration of the aqueous extract of triphala on haloperidol induced catalepsy in mice." Journal of Clinical and Diagnostic Research **4**(1): 2134-2138.

Neuroleptics that are commonly used in the treatment of schizophrenia and other affective disorders are often associated with distressing extrapyramidal side effects (catalepsy). Catalepsy induced by neuroleptics in animals has been used as a model for the extrapyramidal side effects associated with antipsychotic agents in human beings. In the present study, we have attempted to evaluate the protective effect of Triphala on haloperidol induced catalepsy in mice. Inbred albino mice were divided into five groups, each containing six animals. Both, the test drug, the aqueous extract of Triphala and the standard drug scopolamine were dissolved in 1% gum acacia solution. Catalepsy was induced with haloperidol (1mg/kg). The first group received the vehicle (10ml/kg), the second group received scopolamine (1mg/kg) and the remaining three groups of animals received the test compound, Triphala (2.5, 6.25 and 12.5 mg/kg respectively) orally. In the acute study, a single dose of vehicle and the test drug were administered, while in the chronic study, they were given once a day for seven days, 30 minutes prior to haloperidol administration. Catalepsy was determined by the standard bar test after 30 minutes of haloperidol administration and was scored as described by Ahtee and Benumbe. In the acute study, the aqueous extract of Triphala at all the doses tested, significantly ($P<0.01$) reduced the cataleptic score after the latency of 60 minutes. However, in the chronic study, the reduction in the cataleptic score was seen throughout the period of observations. These effects were comparable to that produced by the standard drug scopolamine. Pretreatment of Triphala decreased haloperidol induced catalepsy in mice, which is comparable to that produced by the standard drug scopolamine. Triphala seems to be more effective when it is repeatedly administered than with a single administration. It can be used as an alternative drug or with a combination of currently available drugs in treating drug induced extrapyramidal side effects.

Gopinathan, G. (2013). "Detailed Comparative Pharmacognostical Evaluation of Different Combinations Formulation of Triphala." International Journal of Pharmaceutical & Biological Archive **4**(1).

Goswami, A., S. Agrawal, S. Rajagopala, V. Kori and K. Patel (2015). "Ayurvedic management of Thalassemia Major-A review of clinical researches conducted at IPGT & RA, Jamnagar." International Journal of Ayurvedic Medicine **6**(2).

Thalassemia Major is the most common single gene disorder which represents a major health burden worldwide. The available treatment modalities in conventional medicine i.e. blood transfusion (BT) and iron chelation therapies are associated with complications while bone marrow transplantation etc. are out of reach of many. Present study is aimed to highlight the effective role of Ayurvedic medicines i.e. Dhatri Avaleha, Triphaladi Avaleha and Musta-Triphaladi Avaleha in the management of Thalassemia Major. Till date total five clinical researches have been carried out on Thalassemia Major at PG level in the department of Kaumarbhritya at IPGT&RA, Jamnagar. In which a simple random sampling method was followed. Patients were divided into two groups, Group A (Trial group with Ayurvedic drug intervention and BT) and Group B (Control Group with BT and iron chelation therapy). Assessment was done based on the subjective and objective parameters after completion of treatment. The data obtained in clinical studies was analyzed by using suitable statistical tests. The trial drugs were found to be effective on subjective, objective criteria, BT interval and general health status of Thalassemic patients as well as clinically safe.

Gowda, D. V., G. Muguli, P. R. Rangesh and R. D. Deshpande (2012). "Phytochemical and pharmacological actions of triphala: Ayurvedic formulation - A review." International Journal of Pharmaceutical Sciences Review and Research **15**(2): 61-65.

Triphala is one of the most important and potent Rasayana drug used in Indian System of Medicine. Triphala is a tridoshic rasyana having a balancing and rejuvenating effect on the three constitutional elements that constitute the human life. Triphala is rich in antioxidants, possess antibacterial, anti-viral, anti-cancer property. Triphala is also known to cure cataract and effective in treatment of Acquired immune deficiency syndrome (AIDS). Triphala is rich in many polyphenols, Vitamin C, and flavonoids. This review paper focuses on the phytochemical and therapeutic effect of triphala.

Gupta, M. (2010). "Therapeutic uses of the polyherbal drug Triphala in geriatric diseases." International Journal of Pharma and Bio Sciences **1**(2).

Degenerative physiological changes related to old-age are increasing world over. These geriatric diseases affect almost all vital body systems. The rejuvenating and preventive therapy called Rasayana therapy in Ayurvedic system of Indian medicine deals with prevention, amelioration and cure of geriatric ailments by increasing overall body immunity, fighting infections & antigens, and preventing carcinogenic mutations. A specific polyherbal preparation called Triphala, which consists of equal amounts of fruits of three plants namely Terminalia chebula Retz., Terminalia bellirica Roxb. and Emblica officinalis Gaertn. in fine powder form, has been specifically mentioned in traditional Ayurvedic texts for its beneficial effects in geriatric diseases. It contains tannins, phenols and glycosides which are responsible for its strong antioxidant activity apart from its immunomodulatory, anti-inflammatory, analgesic and antimutagenic properties. These attributes make Triphala an effective remedy for geriatric degenerative diseases.

Gupta, P. C. (2012). "Biological and pharmacological properties of Terminalia chebula Retz. (haritaki)- an overview." International Journal of Pharmacy and Pharmaceutical Sciences **4**(SUPPL.3): 62-68.

Medicinal plants have been considered valuable and cheap source of unique phytoconstituents which are used extensively in the development of drugs against various diseases. A large proportion of the world population, especially in the developing countries relies mainly on the traditional system of medicine. The use of plants and plant products in medicines is getting popularized because the herbal medicines are cheap and have natural origin with higher safety margins and lesser or no side effects. Terminalia chebula Retz. (T. chebula) belongs to the family Combretaceae and is one of the most important medicinal plants used in medicines of ayurveda, siddha, unani and homeopathy. It is called the "King of Medicines" in Tibet and is listed first in the Ayurvedic material medica because of its extraordinary power of wound healing and a wide spectrum of medicinal properties. T. chebula possesses antibacterial, antifungal, antiviral, antidiabetic, antimutagenic, antioxidant, antiulcer and wound healing properties. It also prevents cardiac damage and is used for the treatment of kidney disease. It is a mild, safe and effective laxative in traditional medicine. T. chebula and its phytoconstituents have therapeutic effect with no toxicity. T. chebula is an active ingredient of the well known herbal preparation, Triphala, which is used for the treatment of enlarged liver, stomach disorders and pain in eyes. This review gives a bird's eye view on the biological and pharmacological properties of various extracts and isolated phytoconstituents of T. chebula to enrich our knowledge about this plant.

Gupta, R., B. R. Chandrashekar, P. Goel, V. Saxena, S. Hongal, M. Jain and R. Ganavadiya (2014). "Antimicrobial efficacy of aqueous and ethanolic extracts of Triphala on primary plaque colonizers: An in vitro study." **6**(3): 7-13.

Objective: The aim was to assess the antimicrobial efficacy of the aqueous and ethanolic extracts of Triphala at various concentrations against primary plaque colonizers. Materials and Methods: Preparation of the herbal extracts for this in vitro study was done using cold infusion method. Ethanol and Millipore water were used as solvents for extraction. A stock solution was prepared by adding 1000 mg of dried extract in 1 ml of dimethyl sulfoxide (DMSO). The stock solution was further diluted to obtain 6.25%, 12.5%, 25% and 50% concentrations of the extract. The antimicrobial efficacy testing of Triphala extracts against these bacteria was done by agar well diffusion method. 0.2% chlorhexidine was used as a positive control, while DMSO acted as a negative control. One-way analysis of variance and independent sample t-test were used for comparing mean diameter of inhibition zones. Results: All the concentrations of ethanolic and aqueous extracts of Triphala inhibited the growth of Streptococcus mutans, Streptococcus sanguis and Streptococcus salivarius. In general, the efficacy increased with increasing concentration with maximum inhibition at 50% concentration. There was no statistically significant difference in the mean diameter of inhibition zone between the ethanolic and aqueous extracts of Triphala against S. mutans.

Conclusion: Both aqueous and ethanolic extracts of Triphala have the potential to be used antiplaque agents.

Gupta, R., A. Gupta and R. L. Singh (2015). "Hepatoprotective Activities of Triphala and Its Constituents." International Journal of Pharma Research & Review **4**(1): 34-55.

Liver is a vital organ which plays major role in metabolism and excretion of xenobiotics from the body. Liver injury or its dysfunction is a major health problem that challenges not only health care professionals but also the pharmaceutical industry and drug regulatory agencies. Liver cell injury caused by various toxic chemicals, certain chemotherapeutic agents, carbon tetrachloride, excessive alcohol, overloaded iron is well-studied. Some synthetic compounds such as antimicrobials, anticonvulsants, corticosteroids, NSAIDs and analgesic etc. are currently available as hepatoprotective agents. However, such compounds are not totally safe and exert several side effect and disadvantages. In view of severe adverse side effects of synthetic agents, there is growing need to develop more valuable and protected drugs which may be of therapeutic benefits to patients. Hence herbal drugs have become increasingly popular and their use is increasing day by day. A number of herbal preparations are available in the market. Triphala is one of the age old most commonly used polyherbal formulations with known hepatoprotective activities in Indian system of medicine mainly in Ayurveda. This is well known phytomedicine, a combination of three medicinal plants with Phyllanthus emblica (Amlaki, Phyllanthaceae), Terminalia chebula (Haritaki, Combretaceae) & Terminalia bellirica (Baheda, Combretaceae). Present review focuses on mechanism of hepaotoxicity and various scientifically tested hepatoperotective properties of formulation Triphala and its constituents.

Gupta, R., R. L. Singh and P. Singh (2015). "Quantification of phytochemicals and evaluation of antioxidant potential of ethanolic leaf extract of Terminalia bellerica, Terminalia chebula and Emblica officinalis vis-a-vis Triphala." International Journal of Pharmaceutical Sciences Review and Research **32**(2): 14-22.

The present study was carried out to find out the concentrations of bioactive phytochemicals (ascorbic acid, carotenoid, total phenolic contents, protein and carbohydrate) and evaluation of antioxidant activities of ethanolic leaf extract of Terminalia bellerica (TB), Terminalia chebula (TC), Emblica officinalis (EO) and their formulation Triphala. Among the tested leaf extracts, highest ascorbic acid content was present in EO (118.36 µg 100g-1 of fresh weight) followed by Triphala (115.57), TB (99.18) and TC (94.33). Highest carotenoid content was present in Triphala (6.53 µgg-1 of FW) followed by TB (6.09), TC (5.80) and EO (4.15) whereas TB leaf extract had highest TPC (215.66 mgg-1 of GAE of dry weight) followed by Triphala (213.33), TC (213.05) and EO (177.37). Out of three ethanolic leaf extracts, TB showed minimum IC<inf>50</inf> for FRSA (58 µgml -1), SARSA (38 µgml -1), lipid peroxidation (103 µgml -1), hydroxyl radical scavenging activity (35 µgml -1), FTC activity (117 µgml -1) as well as high reducing power (1.77 ASEml-1). On the basis of our results, it may be concluded that high concentration of phenolic compounds and other bioactive phytochemicals in Triphala and leaf extract of its three constituents are potential source of natural antioxidants.

Gupta, S. K., V. Kalaiselvan, S. Srivastava, S. S. Agrawal and R. Saxena (2010). "Evaluation of anticataract potential of Triphala in selenite-induced cataract: In vitro and in vivo studies." Journal of Ayurveda and Integrative Medicine **1**(4): 280-286.

Triphala (TP) is composed of Emblica officinalis, Terminalia chebula, and Terminalia belerica. The present study was undertaken to evaluate its anticataract potential in vitro and in vivo in a selenite-induced experimental model of cataract. In vitro enucleated rat lenses were maintained in organ culture containing Dulbecco's Modified Eagles Medium alone or with the addition of 100µM selenite. These served as the normal and control groups, respectively. In the test group, the medium was supplemented with selenite and different concentrations of TP aqueous extract. The lenses were incubated for 24 h at 37°C. After incubation, the lenses were processed to estimate reduced glutathione (GSH), lipid peroxidation product, and antioxidant enzymes. In vivo selenite cataract was induced in 9-day-old rat pups by subcutaneous injection of sodium selenite (25 µmole/kg body weight). The test groups received 25, 50, and 75 mg/kg of TP intraperitoneally 4 h before the selenite challenge. At the end of the study period, the rats' eyes were examined by slit-lamp. TP significantly ($P < 0.01$) restored GSH and decreased malondialdehyde levels. A significant restoration in the activities of antioxidant enzymes such as superoxide dismutase ($P < 0.05$), catalase ($P < 0.05$), glutathione peroxidase ($P < 0.05$), and glutathione-s-transferase ($P < 0.005$) was observed in the TP-supplemented group compared to controls. In vivo TF 25mg/kg developed only 20% nuclear cataract as compared to 100% in control. TP prevents or retards experimental selenite-induced

cataract. This effect may be due to antioxidant activity. Further studies are warranted to explore its role in human cataract.

Gurjar, S., A. Pal and S. Kapur (2012). "Triphala and its constituents ameliorate visceral adiposity from a high-fat diet in mice with diet-induced obesity." Alternative Therapies in Health and Medicine **18**(6): 38-45.

Context In India, vaidyas (Ayurvedic physicians) traditionally administer triphala and its constituents as therapeutic agents for promoting digestion and satiety. Objective The research team performed the present study to investigate the effects of triphala and its constituents (T bellirica [bibhitaki], T chebula [haritaki], and E officinalis [amalaki]) on the dietary induction of obesity (diet-induced obesity [DIO]), and other symptoms of visceral obesity syndrome, in mice fed a high-fat diet (HFD). Design The research team obtained 42 fertile, male, Swiss albino mice, weighing 20 g each, and housed them individually in an approved small-animal facility, in a pathogen-free environment. The team generated DIO mice by feeding them a HFD. Setting The study took place at the Birla Institute of Technology and Science (BITS) in Pilani, India. Intervention The research team fed all mice, except those in a control group (ND), a HFD for 10 weeks beginning at 7 weeks of age, supplementing the HFDs with herbal treatments for 4 of the groups. The team divided the mice into six weight-matched groups of seven mice each: (1) normal diet (ND), (2) high-fat diet (HFD), (3) triphala (HFD+T), (4) amalaki (HFD+A), (5) haritaki (HFD+H), and (6) bibhitaki (HFD+B). Outcome Measures The research team evaluated daily energy intake, fasting plasma glucose, serum lipid profile, and liver cytology. The team measured food and energy intake daily for 10 weeks and measured the body weight of each mouse every third day during the course of the experiment. The team drew blood samples at 2, 4, 8, and 10 weeks posttreatment and determined fasting plasmaglucose concentrations and fasting plasma concentrations of cholesterol, triglycerides (TG), LDL, HDL, and plasma alanine transaminase (ALT) using commercial kits. At the completion of the study, a pathologist examined the livers and diagnosed a fatty liver based on the presence of macrovesicular or microvesicular fat in the hepatocytes. Results The research team's results showed that mice fed a HFD for a 10-week period, supplemented with herbal preparation(s) of triphala or its constituents, resulted in significant reductions in body weight (P <.0001), energy intake, and percentage of body fat (P <.001), as compared with mice in the HFD group. Herbal treatment significantly improved the lipid profiles of the mice by lowering serum total cholesterol (Total-C), TG, and low-density lipoprotein cholesterol (LDL-C) and increasing levels of high-density lipoprotein cholesterol (HDL-C) as compared to the mice in the HFD group. The research team also found that herbal treatment attenuated glucose levels, oral glucose tolerance as measured by the oral glucose tolerance test (OGTT), and levels of ALT. In addition to treatment with its three individual components, treatment with a popular Ayurvedic formulation of triphala also reversed the pathological changes in liver tissue and decreased the relative weight of visceral adipose fat pads. Conclusions The present findings suggest that triphala and its constituents can counter the effects of an environment (ie, high dietary intake of fats) and have the potential for use as antiobesity agents with desirable lipid-profile modulating properties.

Harshitha, D., R. Rodda and U. M. Rao (2013). "Evaluation Of Polyherbal Formulation, Livomyn For It's Hepatoprotective And Antioxidant Activity." Der Pharmacia Lettre **5**(6): 135-141.

A Polyherbal formulation, Livomyn comprising of phytoconstituents with potential hepatoprotective activity was evaluated for its hepatoprotective and antioxidant activity using Carbontetrachloride (CCl4) induced hepatotoxicity in Sprague Dawley rats. Livomyn is composed of the extracts of plants like Andrographis paniculata, Phyllanthus niruri,Triphala, Boerhaavia diffusa, Amoora rohituka, Chicorium intybus, Adhatoda vasica, Eclipta alba, Zingiber officinale, Berberis aristata, Fumaria officinalis, Embellia ribes,Tephrosia purpurea, Tinospora codifolia, Coriandrum sati vum, Aloe barbadensis, Picrorrhiza kurroa. Hepatotoxicity was induced in Sprague Dawley rats by intraperitoneal injection of CCl4(1.5mL kg-1,60 in olive oil,1:1 ratio). Livomyn at a dose of 120, 240, 480 mg/kg/day and Silymarin standard 50mg/kg/day was administrated orally for 7 days.The Hepatoprotective effect of Livomyn and standard was evaluated by the assay of biochemical parameters viz...Serum Glutamate Pyruvate Transaminase (SGOT), Serum Glutamate Oxaloacetate Transaminase (SGOT), Alkaline phosphate (ALP), Total Bilirubin Protein (TBP), whereas DPPH Scavenged % was estimated to evaluate antioxidant activity.The toxic effects of CCl4 in Livomyn treated group was controlled significantly by restoration of the levels of serum bilirubin protein, enzymes as compared to the CCl4 treated and silymarin treated groups. Livomyn showed significant hepatoprotective activity as indicated by a decrease in serum marker enzymes (SGOT, SGPT and ALP and increase TBP in a dose dependant manner. Histopathological studies further confirmed the hepatoprotective activity of Livomyn. The present findings are indicative of the hepatoprotective effects

of Livomyn against CCl4 induced oxidative damage being related to its antioxidant and free radical scavenging activity.

Horani, A., D. Shoseyov, I. Ginsburg, R. Mruwat, S. Doron, J. Amer and R. Safadi (2012). "Triphala (PADMA) extract alleviates bronchial hyperreactivity in a mouse model through liver and spleen immune modulation and increased anti-oxidative effects." Therapeutic Advances in Respiratory Disease **6**(4): 199-210.

Objectives: Triphala (TRP), a herbal extract from Tibetan medicine, has been shown to affect lymphocytes and natural killer T (NKT) cell function. We hypothesize that TRP could ameliorate bronchial hyperreactivity through immune-cell modulations. Methods: Asthma mouse models were generated through intraperitoneal (IP) injections of ovalbumin (OVA)/2 weeks followed by repeated intranasal OVA challenges. Mice were then treated with normal saline (OVA/NS) or Triphala (OVA/TRP). Data were compared with mice treated with inhaled budesonide. All groups were assessed for allergen-induced hyperreactivity; lymphocytes from lungs, livers and spleens were analyzed for OVA-induced proliferation and their alterations were determined by flow cytometry. Oxidative reactivity using chemiluminescence, serum anti-OVA antibodies level and lung histology were assessed. Results: Both TRP and budesonide significantly ameliorated functional and histological OVA-induced bronchial hyperreactivity. TRP had no effect on serum anti-OVA antibodies as compared with decreased levels following budesonide treatment. Furthermore, a significant increase in lung and spleen CD4 counts and a decrease in the liver were noted after TRP treatments. Bronchoalveolar fluid from TRP-treated animals but not from the budesonidetreated animals showed anti-oxidative effects. Conclusion: TRP and budesonide caused a significant decrease in bronchial reactivity. TRP treatment altered immune-cell distributions and showed anti-oxidative properties. These findings suggest that immune-cell modulation with TRP can ameliorate lung injury.

Huang, H. Z., S. Y. Zhao, X. M. Ke, J. Z. Lin, S. S. Huang, R. C. Xu, H. Y. Ma, Y. Zhang, L. Han and D. K. Zhang (2018). "Study on the stability control strategy of Triphala solution based on the balance of physical stability and chemical stabilities." Journal of Pharmaceutical and Biomedical Analysis **158**: 247-256.

Triphala is a well-known prescription in Indian Ayurveda and TCM medicine for its great effect on gingivitis and hyperlipidemia. However, its solution is unstable for the containing of excessive polyphenol, leading to the production of sediment in the short term and the decrease of efficacy. Based on the analysis of sediment formation, a novel control strategy is proposed. To conduct the analysis, the sediment formation was recorded for a consecutive five days. The changes in the composition of the supernatant and the sediment were studied by the HPLC profile analysis. The main components of the sediment were identified as corilagin, ellagic acid and gallic acid, and the amount of ellagic acid sediment increased with the storage time. Then, with a series of pH status adjustments of the Triphala solution, the physical and chemical stabilities were acquired by Turbiscan and HPLC respectively. The results showed that as the pH value increased, so did the physical stability, but the particle size and TSI of the association decreased. While the fingerprint of chemical profile similarity decreased, so did the chemical stability. Combining physical and chemical stability parameters, an equilibrium point was found out. When the pH value was adjusted to 5.0, both the physical and chemical stabilities were better: the verification test showed that the sedimentation inhibition rates on the 3rd, 5th,10th and15th days were 41%, 55%, 41%, and 23%, respectively. This manuscript provided a new control strategy that will pique pharmaceutical and food development engineers' interest and trigger research ideas controlling the quality of decoction.

Hutchings, A. and I. E. Cock (2018). "An interactive antimicrobial activity of embelica officinalis gaertn. Fruit extracts and conventional antibiotics against some bacterial triggers of autoimmune inflammatory diseases." Pharmacognosy Journal **10**(4): 654-662.

Background: Embelica officinalis Gaertn. is an Indian plant which is known for its therapeutic properties. It is especially well known as a component of the Ayuverdic medicine Triphala. This study focuses on the growth inhibitory activity of E. officinalis fruit extracts against some bacterial triggers of autoimmune inflammatory diseases, both alone and in combination with conventional antibiotics. Methods: E. officinalis fruit powder was extracted with solvents of varying polarity and screened for bacterial growth inhibition by disc diffusion assay. The minimum inhibitory concentration (MIC) was quantified by both liquid dilution and disc diffusion techniques. To screen for combinatorial effects, the E. officinalis fruit extracts were combined with a range of conventional antibiotics and tested against each bacteria using a liquid dilution assay. Toxicity was examined using Artemia nauplii and HDF bioassays. Results: The ethyl acetate E. officinalis fruit extract displayed the strongest growth inhibitory activity against all of the bacterial triggers of autoimmune inflammatory disease. This extract was a particularly potent inhibitor of P. aeruginosa growth, with an MIC values as low as 264 µg/mL.The ethyl acetate extract was also a moderate to strong

growth inhibitor of P. mirabilis, K. pneumonia and A. baylyi, with MIC values generally 1000-1500 µg/mL. The methanolic and aqueous extracts also inhibited the growth of all bacteria, although generally with only moderate to low activity. Whilst no synergistic interactions were detected in combinations containing the E. officinalis fruit extracts and conventional antibiotics, a number of combinations produced additive effects. These combinations are beneficial as they provide enhanced antibacterial efficacy compared to treatment with the antibiotic or extract components alone. No antagonistic interactions were detected. Therefore, use of the extracts in combination with conventional antibiotics would not compromise the antibiotics efficacy. All extracts were nontoxic in the Artemia nauplii and HDF toxicity assays, further indicating their potential for medicinal use. Conclusion: The E. officinalis fruit extracts were moderate inhibitors of the bacterial triggers of selected autoimmune inflammatory diseases. Furthermore, the extracts potentiated the activity of chloramphenicol and tetracycline against otherwise resistant bacterial strains. Isolation of the active compounds and the potentiating agents may be beneficial in antibiotic drug design.

Ingale, D., P. Kulkarni, S. Koppikar, A. Harsulkar, A. Moghe and S. Jagtap (2018). "Reduced synovial inflammation and inhibition of matrix metalloproteinases explicates anti-osteoarthritis activity of polyherbal formulations." Indian Journal of Pharmacology **50**(1): 22-29.

OBJECTIVES: Current osteoarthritis (OA) research experiences an incline toward Ayurveda to attain a complete cure without notable adverse effects. Ayurveda uses natural products, which are known to perform the multi-faceted role, a much demanding approach for OA management. However, lack of scientific evidence is a major drawback hindering their wider use. The present work investigated the anti-arthritic potential of Ashwagandharishta, Balarishta, Dashmoolarishta, and Triphala-extract to establish molecular-evidence for their clinical use. MATERIALS AND METHODS: Rabbit synoviocytes were induced using interleukin-1 beta (IL-1 β) and lipopolysaccharide (LPS) separately and were further treated with study formulations to test anti-inflammatory and anti-oxidant potential, using nitric oxide (NO) and malondialdehyde (MDA) assays. Collagenase inhibition activity was estimated with N-(3-[2-Furyl] acryloyl)-Leu-Gly-Pro-Ala (FALGPA)-substrate and gelatinase spot assays. Data were analyzed with GraphPad Prism using one-way ANOVA followed by Bonferroni's multiple comparison. RESULTS: The study formulations were effective against synovitis, oxidative-stress, and inhibiting collagenase. They caused NO reduction in selected concentrations. DA showed the maximum NO decline of 0.02 ± 0 and 0.97 ± 0.62 µM/ml with IL-1 β and LPS induction at 5 and 20 µg/ml concentrations, respectively. Estimated by FALGPA assay, increasing collagenase inhibition was observed as the function of concentration. All formulations showed a significant MDA decline, in dose-dependent manner. CONCLUSION: We assessed the anti-OA efficacy of conventionally prescribed Ayurvedic drugs using relevant biochemical assays. The studied formulations revealed potential to restrain synovitis, cartilage degeneration and to reduce oxidative stress, and the signature OA features. With established molecular authenticity, Ayurvedic drugs can offer a safer and affordable therapeutic option for OA.

Intharuksa, A., H. Ando, K. Miyake, P. Sirisa-Ard, M. Mikage and Y. Sasaki (2016). "Molecular analysis of terminalia spp. distributed in Thailand and authentication of crude drugs from terminalia plants." Biological and Pharmaceutical Bulletin **39**(4): 492-501.

Terminalia, a large genus of Combretaceae, is distributed in Tropical Asia, Africa, and America. Some Terminalia plants are used in folk medicine because they possess powerful medicinal properties. Dried fruits of Terminalia bellirica and Terminalia chebula are used as the main ingredient in Triphala, a famous polyherbal formulation in Ayurvedic medicine and Thai folk medicine, because of their laxative, detoxifying, and rejuvenating effects. To clarify the phylogenetic relationships of medicinal Terminalia species (T. bellirica, T. chebula, and T. catappa) and authenticate their crude drugs, "Samo" and Triphala, nucleotide sequencing alignments in the internal transcribed spacer one-two (ITS 1-2) regions of Terminalia plants collected in Thailand were performed. The amplified fragments of Terminalia species were approximately 800 bp in length. To compare these sequences and DDBJ registered data, a molecular phylogenetic tree was constructed. Phylogenetic analysis clearly separated the sequences into two groups: Asian Terminalia and African Terminalia with some exceptions. In the analyzed sequences, the length of the ITS1-5.8S-ITS2 region was 674 bp in T. chebula, and 677 bp in T. bellirica and T. catappa. Eighty-one single nucleotide polymorphisms (SNPs) and nine insertion-deletions (indels) were observed, and the nucleotide sequences of this region showed species-specific sequences. Based on these differences, polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) and amplification refractory mutation system (ARMS) were applied to identify medicinal Terminalia species. Moreover, the

ARMS method was chosen for fingerprinting analysis of Samo crude drugs and Triphala formulations because it was a fast, cost-effective, and reproducible approach.

Jadon, A., M. Bhadauria and S. Shukla (2007). "Protective effect of Terminalia belerica Roxb. and gallic acid against carbon tetrachloride induced damage in albino rats." Journal of Ethnopharmacology **109**(2): 214-218.

Terminalia belerica Roxb. is one of the oldest medicinal herb of India, is an ingredient of Indian Ayurvedic drug 'triphala' used for the treatment of digestion and liver disorders. Present study is aimed to evaluate the protective effect of Terminalia belerica fruit extract and its active principle, gallic acid (3,4,5-trihydroxybenzoic acid) at different doses against carbon tetrachloride intoxication. Toxicant caused significant increase in the activities of serum transaminases and serum alkaline phosphatase. Hepatic lipid peroxidation level increased significantly whereas significant depletion was observed in reduced glutathione level after carbon tetrachloride administration. A minimum elevation was found in protein content on the contrary a significant fall was observed in glycogen content of liver and kidney after toxicant exposure. Activities of adenosine triphosphatase and succinic dehydrogenase inhibited significantly in both the organs after toxicity. Treatment with TB extract (200, 400 and 800 mg/kg, p.o.) and gallic acid (50, 100 and 200 mg/kg, p.o.) showed dose-dependent recovery in all these biochemical parameters but the effect was more pronounced with gallic acid. Thus it may be concluded that 200 mg/kg dose of gallic acid was found to be most effective against carbon tetrachloride induced liver and kidney damage.

Jagadish, L., V. K. Anand Kumar and V. Kaviyarasan (2009). "Effect of Triphala on dental bio-film." Indian Journal of Science and Technology **2**(1): 30-33.

The free radical scavenging property and antimicrobial activity of Triphala- the herbal product made of equal proportion of Terminalia chebula, Terminalia belerica and Emblica officinalis, were evaluated. Ethanol extracts of the formulation were tested for its total antioxidant activity using improved ABTS radical cation decolorizing assay and antibiotic assay against Streptococcus mutans (predominantly involved in bio-film formation on human teeth). An effort was also made to correlate its antiplaque activity using an in-vitro assay (conditions were kept similar to oral cavity) with Triphala and two commercial toothpastes (Product 1 and product 2). The herbal extract effectively inhibited the bio-film formation and the better antioxidant activity exhibited by the extract might protect the gum cells effectively from free radicals than the commercial toothpastes. Thus Triphala can be used as an effective antiplaque agent. © Indian Society for Education and Environment (iSee).

Jagetia, G. C., M. S. Baliga, K. J. Malagi and M. Sethukumar Kamath (2002). "The evaluation of the radioprotective effect of triphala (an ayurvedic rejuvenating drug) in the mice exposed to γ-radiation." Phytomedicine **9**(2): 99-108.

The effect of 0, 5, 6.25, 10, 12.5, 20, 25, 40, 50 and 80 mg/kg b. wt. of aqueous extract of triphala (an Ayurvedic herbal medicine) administrered intraperitoneally was studied on the radiation-induced mortality in mice exposed to 10 Gy of γ-radiation. Treatment of mice with different doses of triphala consecutively for five days before irradiation delayed the onset of mortality and reduced the symptoms of radiation sickness when compared with the non-drug treated irradiated controls. The highest protection against GI (gastrointestinal) death was observed for 12.5 mg/kg triphala, where a highest number of survivors were reported up to 10 days post-irradiation. While 10 mg/kg triphala i.p. provided the best protection as evidenced by the highest number of survivors after 30 days post-irradiation in this group when compared with the other doses of triphala. Toxicity study showed that triphala was non-toxic up to a dose of 240 mg/kg, where no drug-induced mortality was observed. The LD50 dose i.p. of triphala was found to be 280 mg/kg b. wt. Our study demonstrates the ability of triphala as a good radioprotective agent and the optimum protective dose of triphala was 1/28 of its LD50 dose.

Jagetia, G. C., K. J. Malagi, M. S. Baliga, P. Venkatesh and R. R. Veruva (2004). "Triphala, an ayurvedic Rasayana drug, protects mice against radiation-induced lethality by free-radical scavenging." Journal of Alternative and Complementary Medicine **10**(6): 971-978.

The effects of 10 mg/kg of triphala extract (TE) was studied on radiation-induced sickness and mortality in mice exposed to 7-12 Gray (Gy) of γ-irradiation. Treatment of mice with triphala once daily for 5 consecutive days before irradiation delayed the onset of mortality and reduced the symptoms of radiation sickness when compared with the non-drug double distilled water treated irradiated controls (DDW). Triphala provided protection against both gastrointestinal and hemopoetic death. However, animals of both the TE + irradiation and DDW + irradiation groups did not survive up to 30 days post-irradiation beyond 11 Gy irradiation. The LD50/30 was found to be 8.6 Gy for the DDW + irradiation group and 9.9

Gy for TE + irradiation group. The administration of triphala resulted in an increase in the radiation tolerance by 1.4 Gy, and the dose reduction factor was found to be 1.15. To understand the mechanism of action of triphala, the free radical scavenging activity of the drug was evaluated. Triphala was found to scavenge asterisk inside a circle signOH, O2asterisk inside a circle sign- 2,2′-azinobis(3-ethylbenzthiazoline-6-sulfonate) diammonium salt (ABTS)asterisk inside a circle sign+ and NOasterisk inside a circle sign radicals in a dose dependent manner.

Jagetia, G. C., S. K. Rao, M. S. Baliga and K. S. Babu (2004). "The evaluation of nitric oxide scavenging activity of certain herbal formulations in vitro: A preliminary study." Phytotherapy Research **18**(7): 561-565.

The nitric oxide (NO) scavenging activities of traditional polyherbal drugs like abana, chyavanaprasha, geriforte, septilin, mentat and triphala were examined using sodium nitroprusside as a NO donor in vitro. All the drugs tested demonstrated direct scavenging of NO and were superior to Gingko biloba, which was used as a positive control. The extracts of various polyherbal drugs exhibited dose-dependent NO scavenging activities and the potency was in the following order: abana > chyavanaprasha > triphala > geriforte > septilin > mentat > Gingko biloba. The present results suggest that the traditional Indian polyherbal crude drugs may be potent and novel therapeutic agents for scavenging of NO, and thereby inhibit the pathological conditions caused by excessive generation of NO and its oxidation product, peroxynitrite. These findings may also help to explain, at least in part, the pharmacological activities like rejuvenating, adaptogenic, anti-infection, anti-inflammatory, cardioprotective and neuroprotective activities of these traditional, clinically used non toxic drugs.

Jain, V., S. Saraf and S. Saraf (2007). "Standardization of Triphala Churna: Spectrophotometric approach." Asian Journal of Chemistry **19**(2): 1406-1410.

A widely used Ayruvedic preparation, 'Triphala Churna' prepared using dried fruits of amla, baheda and harda, was estimated spectrophotometrically for its tannic acid content. Three-laboratory batch of Triphala Churna and powdered amla, bahera, harda, were estimated for their tannic acid contents against standard tannic acid solution on double beam UV-Visible Spectrophotometer at λmax 276 nm. The tannic acid content of all the three batches is found to be in close proximities with each other and recovery studies are indicated of reproducibility of method. Hence the present method is simple, sensitive, precise and accurate and can be adopted for routine quality control of Triphala Churna.

Jain, V., A. Vyas, S. Saraf and S. Saraf (2011). "TLC densitometric methods for quantification of gallic acid in Triphala churna for routine quality control." Research Journal of Pharmacy and Technology **4**(2): 230-233.

Quantification of active principles through modern analytical tools is essential for establishing the authenticity, creditability, prescription and usage of Ayurvedic medicines/herbal formulations. Triphala churna is one of the popular Ayurvedic preparations, official in Ayurvedic formulary of India. The present study is an attempt to develop a fingerprint method for Triphala churna with TLC Densitometric Methods (HPTLC) using gallic acid as a standard. The gallic acid is a major content in all the three ingredients of the formulation. The method was validated for linearity, accuracy, limit of detection, limit of quantification, inter-day and intra-day assay precision, repeatability of measurement, and repeatability of sample application. The concentration of gallic acid present in raw material was found to be 3.10±0.41% w/w in Emblica officinalis, 8.47±0.82% w/w in Terminalia belerica, and 4.63±0.49% w/w in Terminalia chebula. Gallic acid content in three identical laboratory batch of Triphala churna TP-I, TP-II and TP-III, was found to be 5.39±0.48%, 5.42±0.46% and 5.41±0.52% w/w respectively with mean value 5.41±0.49%. The gallic acid content in all the three different batches is found to be in close proximities with each other. The results were comparable to marketed formulations.

Jayajothi, E., T. Elavarasu, M. Hamsaveni and S. K. Sridhar (2004). "Antioxidant Activity and Total Phenolic Content of Triphala churna." Natural Product Sciences **10**(1): 16-19.

Triphala chuma is a widely used herbal formulation that contains equal proportion of dried fruit powder of Emblica officinalis, Terminalia chebula and Terminalia belirica. In the Indian system of medicine, it is used in cleaning wounds, urinary disorders, diabetes mellitus, leprosy, constipation, eyesight promotion, piles, and as a rejuvenator. In the present study, the methanolic extract of 5 commercial Triphala was evaluated for antioxidant activity by 1,1-diphenyl-2-picryl-hydrazyl free radical scavenging method, total phenolic content by Folin-Ciocalteu method and gallic acid equivalents (GAE) by high performance thin layer chromatographic (HPTLC) method. All extracts exhibited antioxidant activity significantly. The IC50 of the extracts ranged between 7.16 to 12.96 µg/ml. The total phenolic content of the extracts was found to be 195.3-296.4 mg of GAE/gm dw. The HPTLC chromatographic data reveal that the content of GAE

present in the extract was found to be 7.17-4.11 µg/ml. The study reveals that out of the chumas analysed, C was found to exhibit the most potent antioxidant activity. A clear correlation between IC50 and content of GAE nor the total phenolic content could be observed. The study reveals that the consumption of Triphala would exert several beneficial effects by virtue of its antioxidant activity.

Joshi, A. A. and P. M. Dyawarkonda (2017). "Formulation and evaluation of polyherbal hair oil." International Journal of Green Pharmacy **11**(1): S135-S139.

Aim: This study aimed at reviewing the importance of polyherbal hair oil for the treatment of common hair problems such as baldness, alopecia, hair fall, gray hair, dryness, and most common dandruff. Materials and Methods: The various herbal ingredients are used in the formulation are: Amla, Bhringraj, Yashtimadhu, Triphala, Henna, Neem, Aloe vera, hibiscus flowers, coconut oil, cow milk, grated coconut, and water. All ingredients provide essential nutrients such as vitamin, antioxidant, protein, terpenoids, and many essential oils to maintain normal function of sebaceous glands. Procedure for oil preparation is divided into two parts: (1) preparation of decoction of all the herbs and (2) oil preparation. Results and Discussion: Excellent results of hair growth were seen in formulation prepared by the abovementioned procedure. Formulated herbal oil was evaluated for various parameters such as specific gravity, viscosity, acid value, saponification value, pH, and irritation tests. Conclusion: In general, herbal formulation provides good blend of vitamins, antioxidants, terpenoids, and essential oils. All the values in the evaluation of finished product showed that they are within the acceptable limits. Hence, it is concluded that the oil is beneficial in maintaining good growth of hairs, turning gray hairs to black, providing protection from dandruff, and results in lustrous hairs.

K.L. Shanbhag, V. (2015). "Triphala in Prevention of Dental Caries and as an Antimicrobial in Oral Cavity- A Review." Infectious Disorders - Drug TargetsDisorders) **15**(2): 89-97.

Dental caries is a widely prevalent infectious disease afflicting the humans worldwide. Each year oral infections such as dental caries, periodontal diseases and oral candidiasis significantly adds to the economic burden of the world. Though there are standard management techniques for these diseases; they do have side effects and are not cost effective. Ayurveda is a traditional Indian system of medicine that is being practiced in the Indian peninsula since ages. Among the various herbal medicines in ayurveda, triphala occupies a royal position due to its wide beneficial systemic actions. Triphala is a mixture of fruits of Terminalia bellirica, Terminalia chebula and Emblica officinalis. The antimicrobial actions of triphala are well documented in the literature. However availability of review articles regarding triphala as an antimicrobial against oral infections is limited. Need was felt to review this aspect of triphala. The present article reviews the use of triphala and its constituents in the prevention and control of dental caries and other common oral infections. Thorough review of the literature indicated that triphala can be effectively used to manage dental caries, gingival and periodontal diseases. Further it can also be utilized as a root canal irrigant and against oral candida species.

Kalaiselvan, S. and M. Rasool (2015). "Triphala exhibits anti-Arthritic effect by ameliorating bone and cartilage degradation in adjuvant-induced arthritic rats." Immunological Investigations **44**(4): 411-426.

The present study was aimed to investigate the anti-Arthritic effect of triphala and its underlying mechanism on adjuvant-induced rat model. For comparison purpose, non-steroidal anti-inflammatory drug indomethacin was used. Arthritis was induced by intradermal injection of complete Freund's adjuvant (0.1ml) into the right hind paw of the Wistar albino rats. Triphala (100mg/kg body weight [bwt]) was administered intraperitoneally (from 11th to 20th day) after the arthritis induction. Arthritis induction increased the levels of reactive oxygen species (LPO and NO), elastase, and mRNA expression of pro-inflammatory cytokines (TNF-α, IL-β, IL-17, IL-6 and MCP-1), inflammatory marker enzymes (iNOS and COX-2), receptor activator of nuclear factor kappa-B ligand (RANKL), and transcription factors (NF-kB p65 and AP-1) in the paw tissues of rats. The levels of bone collagen were found to decrease with increased urinary constituents (hydroxyproline and total glycosaminoglycans) in arthritic rats. In addition, the immunohistochemistry analysis revealed increased expression of NF-kBp65 and COX-2 in the paw tissues of arthritic rats. However, administration of triphala significantly inhibited the biochemical and molecular alterations in adjuvant-induced arthritic rats compared to indomethacin (3mg/kg bwt) as evidenced by the radiological and histopathological analysis. In conclusion, our results suggest that triphala administration ameliorate bone and cartilage degradation during rheumatoid arthritis.

Kalaiselvan, S. and M. K. Rasool (2015). "The anti-inflammatory effect of triphala in arthritic-induced rats." Pharmaceutical Biology **53**(1): 51-60.

Context: Triphala, an Indian Ayurvedic herbal formulation which contains Terminalia chebula Retz. (Combretaceae), Terminalia bellerica (Gaertn.) Roxb. (Combretaceae) and Emblica officinalis L. (Phyllanthaceae), is used for treating bowel-related complications, inflammatory disorders, and gastritis. Objective: To determine the anti-arthritic effect of triphala in arthritis-induced rats. For comparison purpose, the non-steroidal anti-inflammatory drug indomethacin was used. Materials and methods: Arthritis was induced in Wistar albino rats by intradermal injection of complete Freund's adjuvant (0.1 ml) into the foot pad of right hind paw. Triphala (100 mg/kg b wt, i.p.) was administered from day 11 to 18 after the administration of complete Freund's adjuvant. The activities/levels of lysosomal enzymes, glycoproteins, antioxidant status, and lipid peroxidation were determined in the paw tissues of arthritic rats. In addition, the inflammatory mediators were also measured in both the serum and the paw tissue of arthritic rats. Results: The levels/activities of lipid peroxidation (~41.5%), glycoproteins (hexose ~43.3%, hexosamine ~36.5%, and sialic acid ~33.7%), lysosomal enzymes (acid phosphatase ~52.4%, β-galactosidase ~22.9%, N-acetyl β-glucosaminidase ~22.1%, and cathepsin-D ~27.7%) were found to be decreased and the antioxidant status (SOD ~75.6%, CAT ~62.7%, GPx ~55.8%, GST ~82.1%, and GSH ~72.7%) was increased in the paw tissues of triphala-treated arthritic rats. In addition, the inflammatory mediator levels in serum (TNF-α ~75.5%, IL-1β ~99%, VEGF ~75.2%, MCP-1 ~76.4%, and PGE2 ~69.9%) and in paw tissues (TNF-α ~71.6%, IL-1β ~75.5%, VEGF ~55.1%, MCP-1 ~69.1%, and PGE2 ~66.8%) were found to be suppressed. Conclusion: Triphala has a promising anti-inflammatory effect in the inflamed paw of arthritis-induced rats.

Kalaiselvan, S. and M. K. Rasool (2016). "Triphala herbal extract suppresses inflammatory responses in LPS-stimulated RAW 264.7 macrophages and adjuvant-induced arthritic rats via inhibition of NF-κB pathway." Journal of Immunotoxicology **13**(4): 509-525.

Abstract: This study sought to explore the mechanism of anti-inflammatory effect of triphala in lipopolysaccharide (LPS)-stimulated RAW 264.7 macrophages and in adjuvant-induced arthritic rats. In stimulated RAW 264.7 cells, triphala (100–300 μg/ml) significantly suppressed production of inflammatory mediators (e.g. TNFα, IL-1β, IL-6, MCP-1, VEGF, NO, PGE2), intracellular free radicals and release of lysosomal enzymes (e.g. acid phosphatase, β-galactosidase, N-acetyl glucosamindase and cathepsin D) in a dose-related manner. With triphala, mRNA levels of genes for pro-inflammatory TNFα, IL-1β, IL-6 and MCP-1, inflammatory iNOS and COX-2 enzymes and NF-κBp65 were down-regulated in the stimulated cells; in contrast, there was up-regulation of heme oxygenase-1 (HO-1) expression. Western blot analyses revealed that triphala suppressed the protein expression of NF-κB p65 and p-NF-κB p65 in the stimulated cells, which subsequently reduced over-expression of TNFα, IL-17, iNOS and COX-2 in a manner similar to that observed with BAY 11-7082, an IκB kinase inhibitor. Immunofluorescence analysis revealed inhibition of p-NF-κB p65 nuclear translocation and COX-2 protein expression caused by triphala. Consistent with these findings, the animal studies presented confirmed that triphala exhibited anti-inflammatory effects in a rat adjuvant-induced arthritis model by reducing of inflammatory mediator (e.g. IL-17, COX-2 and RANKL) expression via inhibition of NF-κB activation. Taken together, the results here demonstrated that triphala has potential anti-inflammatory applications that could be used for the treatment of inflammatory disorders, including rheumatoid arthritis.

Kamali, S. H., A. R. Khalaj, S. Hasani-Ranjbar, M. M. Esfehani, M. Kamalinejad, O. Soheil and S. A. Kamali (2012). "Efficacy of 'Itrifal Saghir', a combination of three medicinal plants in the treatment of obesity; A randomized controlled trial." DARU, Journal of Pharmaceutical Sciences **20**(1).

Background: Herbal combination of Itrifal Saghir (triphala) has been widely used in traditional medicine. And brings health benefits such as antioxidant effect and scavenger of hydroxyl radicals and nitric oxide radicals activity and substantiated in traditional medicine a anti-obesity. Material and method. In this study we aimed to assess the efficacy of this herbal medicinal on reduction of weight and body mass index (BMI) of simple obese subjects in comparison with placebo. Obese subjects aged between 16 and 60 years were selected for 12-week, double-blind, randomized, placebo-controlled trial using a parallel design. Subjects were randomly assigned to take 5 grams of either the Itrifal Saghir (n = 31) or placebo (n = 31), 2 times daily for 12 weeks. Measures of body weight, BMI, waist circumference (WC), hip circumference (HC), were assessed at baseline and once every four weeks during the 12 week treatment period. The safety was evaluated by means of measuring the liver and kidney function. Homeostasis model of insulin resistance (HOMA-IR) was calculated as [fasting insulin (μU/mL) × fasting glucose (mmol/L)/22.5]. Results: Compared to placebo group, in treatment group the mean difference of effective weight loss was 4.82Kg (CI95% 3.52 - 6.11, $\rho < 0.001$), the mean of decrease in waist circumference was 4.01 cm (CI 95% 2.13 - 5.90, $\rho < 0.001$), and the mean decrease in hip circumference was 3. 21 cm (CI 95% 1.96 - 4.45, $\rho < 0.001$) in treated subjects.

No adverse effects or significant changes in liver and kidney function tests were observed in both placebo and treated groups. Conclusions: Itrifal Saghir appears to produce a positive effect on weight loss in obese subjects.

Kamble, R., S. Sathaye and D. Shah (2008). "Evaluation of antispasmodic activity of different Shodhit guggul using different shodhan process." Indian Journal of Pharmaceutical Sciences **70**(3): 368-372.

According to ayurvedic texts shodhan vidhi is an important process which enhances the biological activity of a compound and reduces the toxicity at the same time. Before incorporating into formulations, guggul is processed using Shodhan vidhi involving different shodhan dravyas like gulvel, gomutra, triphala, dashmul. We have evaluated the antispasmodic activity of guggul on ileum of guinea pig and Wistar rats. The animals were sacrificed and ileum tissue of guinea pig and rat was isolated and tested for antispasmodic activity using different spasmogens like acetylcholine, histamine and barium chloride. It was observed that the different shodhit guggul (shudha guggul) i.e. processed using different shodhan vidhi, showed good antispasmodic activity as compared to Ashudha guggul. When acetylcholine was used as spasmogen, gulvel and triphala shodhit guggul showed good antispasmodic activity than other shodhit guggul. Thus shodhan vidhi enhances the therapeutic properties of guggul.

Kantamreddi, V. S. S., T. V. Vasupalli, M. K. Malasani and S. Boddana (2017). "Differentiation of five commercially available triphala churnas of an ayurvedic formulation by elemental fingerprint." Pharmacognosy Journal **9**(1): 117-122.

Introduction: Triphala churna (TPC) is one of the well known Ayurvedic powdered preparations of Indian System of Medicine and is used in the treatment of various diseases. Elemental pattern of TPC was developed in order to investigate the identity and quality of commercial TPC drugs. Method: Inductively coupled plasma mass spectrometry (ICP-MS) was used for the quantitative determination of ten essential and trace elements in five marketed samples of Triphala churna. The concentration patterns of these elements were deciphered by multivariate statistical analysis such as hierarchical cluster analysis (HCA), fuzzy c-means (FCM) and k-means (KM) cluster analysis. Results: The elemental concentrations ranged from 1.3 mg/kg (Cr, TPC3) to 14220 mg/kg (K, TPC4). The elemental fingerprint of Triphala churna was established based on three churnas viz. TPC1, TPC3 and TPC5, which were found in one cluster with a very high degree of similarity by KM, FCM and HCA techniques. Conclusion: Based on the results, the graphical pattern of elements detected in these samples can be considered as elemental fingerprint of Triphala churna and can be used for authentication and/or to determine the quality of commercial TPC drugs.

Kantamreddi, V. S. S., V. T. Veni and G. Y. S. K. Swamy (2017). "A quantitative approach to estimate both essential and non-essential elements in some commercial samples of triphala churna by using WD-XRF spectrometry." Pharmacognosy Journal **9**(3): 378-381.

Introduction: The need for quality control of herbal drugs is in demand in order to ensure the purity, safety and efficacy of herbal products. A total of 19 elements including essential and non-essential elements were characterized in five commercial samples of Triphala churna using WD-XRF spectrometry. Method: The WD-XRF method was validated for each element by a pre-calibrated program using five Chinese certified reference materials of vegetable standards (NCS ZC73012, NCS ZC73013, NCS ZC73017, NCS ZC85006 and NCS DC73348). Results: The following elements were detected in all the samples out of 19 elements tested with increasing order of concentrations (mg/kg): Cr (3) < Cu (7) < Ba (24) < Zn (31) < Pb (46) < Mn (57) < S (700) < Na (1064) < Mg (1250) < Fe (1329) < P (1400) < Cl (2960) < Ca (3110) < Si (4350) < K (15130). Lead (41-46 mg/kg), a nonessential element was found above its PDE limit (≤ 10 mg/kg). Conclusion: WD-XRF method was found simple, rapid, reliable and non-destructive technique to investigate the elemental concentrations in herbal drugs.

Katakdound, S. D. (2015). "A randomised controlled clinical trial to evaluate effect of Ayurvedic formulation in postnatal care." Journal of Ayurveda and Holistic Medicine (JAHM) **3**(1).

Aim: Postnatal care with Ayurvedic medicine is the basic concept behind this clinical trial. Methods and Material: In the present study 20 uncomplicated vaginally delivered patients with episiotomy were taken from the study centre and divided into two groups. In GroupA(n=10) patients were treated with Gandhak Rasayanavati, Sookshma Triphalavati & Triphala Kwath & in GroupB(n=10) Tab.Ciprofloxacin + Tinidazole (500+200) mg, Tab Serratiopeptidase 10mg, Betadine ointment & liquid Dettol for 7 days and results were observed. In observation clinical findings were noted on 0th,3rd, 6th & 9th day. Statistical analysis used: The improvement in the cardinal symptoms were compared and analyzed statistically between the end of the treatment and baseline by using student's paired 't' test. The investigations also analyzed using

student's unpaired 't' test. Results: In the GroupA no generalized or localized sepsis observed in any patient. Quality of wound healing, involution of uterus, nature of lochia and local tenderness shows statistically equal 't' value i.e. 0, 0.710, 0.534 and 0.599 respectively when compared with GroupB. Conclusions: It can be concluded that the Ayurvedic drugs are significantly effective in postnatal care when compared with modern drugs to combat infections. Hence Gandhak Rasayanavati, Sookshma Triphalavati & Triphala Kwath is practically reliable to use in postnatal care.

Kaur, S., S. Arora, K. Kaur and S. Kumar (2002). "The in vitro antimutagenic activity of Triphala - An Indian herbal drug." Food and Chemical Toxicology **40**(4): 527-534.

A study to evaluate an antimutagenic potential of water, chloroform and acetone extracts of Triphala has been made in an Ames histidine reversion assay using TA98 and TA100 tester strains of Salmonella typhimurium against the direct-acting mutagens, 4-nitro-o-phenylenediamine (NPD) and sodium azide, and the indirect-acting promutagen, 2-aminofluorene (2AF), in the presence of phenobarbitone-induced rat hepatic S9. A combination drug 'Triphala' - a composite mixture of Terminalia bellerica, T. chebula and Emblica officinalis, has been used in traditional system of medicine for the treatment of many malaises, such as heart ailments and hepatic diseases. The drug was sequentially extracted with water, acetone and chloroform at room temperature. The study revealed that water extract was ineffective in reducing the revertants induced by the mutagens. The results with chloroform and acetone extracts showed inhibition of mutagenicity induced by both direct and S9-dependent mutagens. A significant inhibition of 98.7% was observed with acetone extract against the revertants induced by S9-dependent mutagen, 2AF, in co-incubation mode of treatment. Various spectroscopic techniques, namely 1H-NMR, normal 13C-NMR, distortionless enhancement by polarization transfer (DEPT-90 and DEPT-135), UV and IR, are under way to identify the polyphenolic compounds from an acetone extract.

Kaur, S., H. Michael, S. Arora, P. L. Härkönen and S. Kumar (2005). "The in vitro cytotoxic and apoptotic activity of Triphala - An Indian herbal drug." Journal of Ethnopharmacology **97**(1): 15-20.

A study on cytotoxic effect of acetone extract of "Triphala" whose antimutagenicity has already been tested (Kaur S., Arora S., Kaur K., Kumar S., 2002. The in vitro antimutagenic activity of Triphala - an Indian herbal drug. Food Chemistry and Toxicology 40, 47-54) was extended to test its cytotoxic effects on cancer cell-lines using Shionogi 115 (S115) and MCF-7 breast cancer cells and PC-3 and DU-145 prostate cancer cells as models. The results revealed that acetone extract of "Triphala" showed a significant cytotoxic effect on these cancer cell-lines and the effect was similar on all cancer cell lines used in this study. The major phenolic compounds in the most potent acetone extracts were isolated and purified. Structural analysis was conducted using spectroscopic techniques including mass spectroscopy, nuclear magnetic resonance (NMR) and infrared (IR) which showed gallic acid as the major component. The suppression of the growth of cancer cells in cytotoxic assays may be due to the gallic acid - a major polyphenol observed in "Triphala".

Khushtar, M., H. H. Siddiqui, R. K. Dixit, M. S. Khan, D. Iqbal and M. A. Rahman (2016). "Amelioration of gastric ulcers using a hydro-alcoholic extract of Triphala in indomethacin-induced Wistar rats." European Journal of Integrative Medicine **8**(4): 546–551.

Introduction: Triphala is widely prescribed herbal drug in the Indian traditional system of medicine. It is rich in antioxidants and possesses diverse beneficial properties. It is used to treat many diseases such as anemia, jaundice, constipation, asthma, fever, chronic ulcer and various gastrointestinal disorders. The aim of this study was to investigate the ulcer ameliorative effect of hydro-alcoholic extract of Triphala in indomethacin-induced gastric ulcer in Wistar rats. Methods: Gastric ulcer was induced by indomethacin (10. mg/kg. b. wt, po) in Wistar rats. Triphala extract (1000. mg/kg. b. wt, po) or vehicle (1. ml/kg/day po of 1% CMC) was given to the rats for 15 days by oral gavage (n = 6). The ulcer ameliorative effect of Triphala extract was compared with standard drug ranitidine (50. mg/kg. b. wt, po for 15 days). The ulcer index was calculated. Gastric histopathology and biochemical parameters like mucus, lipid peroxide, glutathione (GSH), catalase (CAT), superoxide dismutase (SOD) were determined. Results: Treatment with Triphala extract significantly decreased the levels of ulcer index and lipid peroxide in the treated rats. The extract also significantly elevated the levels of mucus, GSH, CAT and SOD. These findings matched the results of histolopathological studies. Conclusion: Triphala extract possesses ulcer ameliorative effect in gastric ulcer through strengthening the gastric mucosa, restoring the free radical scavenging enzymes and reducing the lipid peroxide production.

Kirubanandan, S., K. Swethkamal and S. Renganathan (2013). "Activities of triphala towards promoting collagen synthesis at wound site and inhibiting methicillin-resistant Staphylococcus aureus and its enzymes." International Journal of Pharmacy and Pharmaceutical Sciences **5**(2): 54-62.

Problem Statement: Infection is a major problem in the management of wounds. Despite the use of synthetic antimicrobial agents, drug resistance and toxicity hinder the activity of these antimicrobial agents; thereby increase the chances of infection. The microbial enzymes produced by wound pathogens degrade the extra cellular matrix at wound site. The present study investigates the influence of Triphala on changes in collagen characteristics during the healing process of an infected cutaneous wound in Albino Wister rats and also how the antimicrobial activity and enzyme inhibition activity of triphala used in wound healing studies. Approach: A methanol extract of triphala was prepared and its antimicrobial activity was tested against twenty clinical MRSA strains. The activity of triphala extract against serine protease and metalloprotease was studied by Zymography. Enzymatic activities were detected as clear bands of casein/gelatin lysis against a dark background. To measure the relative enzyme levels, clear zones were scanned and the percentage of inhibition was analyzed by Gel Documentation systems. The inhibition of enzymes by Triphala has been expressed in percentage and expressed as mean ± SD of ten experiments. Male Wister albino rats of weights ranging between 150g and 200g were used for in vivo wound healing study. Granulated tissues were collected on the 4th, 8th, 12th and 16th days for the estimation of different types of collagen present in the granulated tissue and also for histological studies. Statistical Analysis: All results are expressed as a mean ± S.D and the results were compared statistically by a student's independent t- test using SPPS software. A statistically significant p value of less than 0.05 was considered. Result: The 18±2mm clear zone in disc diffusion assay and minimal inhibitory concentration (MIC) of 7.8125mg/ml against MRSA (as well as methicilin susceptible Staphylococcus aureus) control strains clearly showed the antibacterial activity of Triphala. Zymography analysis exhibited greater reduction in serine protease and metalloprotease activity at ≥1500µg/ml. The wound tissues that were removed on the 4th, 8th, 12th and 16th day (post-wound), were used to analyze the biochemical and pathological changes on the injured tissue. Triphala increased cellular proliferation and collagen synthesis at the wound site, as evidenced by increase in type III collagen content of wound tissues. The Masson's Trichrome staining of granulated tissue confirmed that the treated subset of tissues had well-formed epithilization with well stretched bundles of collagen when compared to that of an open wound group (untreated). Better maturation and cross linking of collagen was observed in those rats which were treated with Triphala. Conclusion: By virtue of the inhibitory effect of Triphalaon different MRSA strains and their enzymes such as serine protease and metalloprotease, it could be, potentially used as a new therapeutic agent for MRSA infected dermal wounds. The results hence highlighted the beneficial effects of the topical application of Triphala in the acceleration of wound healing and its effect on collagen synthesis.

Kizhakkeveettil, A., P. S. Jayagopal and K. Rose (2011). "Hypercholesterolemia and Ayurvedic Medicine: A Case Report." Topics in Integrative Health Care **2**(2): ID: 2.2006.

Background: Over the last two decades there has been an increasing emphasis placed on screening for high cholesterol and adopting interventions to reduce cholesterol levels in order to reduce the risk of heart disease. The high costs and side effects of hypercholesterolemia medications have led many people to search for alternate treatments. Only a few studies have been conducted to evaluate the effect of Ayurvedic herbal medicine formulae on hypercholesterolemia. Objective: The objective of this article is to describe a case where Ayurvedic herbs appeared to have been helpful in the management of hypercholesterolemia. Clinical Features: This patient was a 46-year-old woman who had been diagnosed with hypercholesterolemia two years prior to presentation. She had not responded to conventional treatment. Intervention and Outcome: She was treated for eight months with the Ayurvedic formulae Kaishora Guggulu, Triphala and a custom made herbal tea mix. Her total cholesterol dropped from 270 to 208 mg/dl, her LDL dropped from 191 to 146 mg/dl, and her HDL rose from 57 to 63 mg/dl. There were no side effects reported. Conclusions: This case demonstrates the use of Ayurvedic herbs in the management of hypercholesterolemia. Further high quality studies with randomized clinical trials should be conducted to better understand the effectiveness of Ayurvedic treatment for hypercholesterolemia. Ayurvedic treatment for this patient consisted solely of the use of herbal formulae over an eight-month period. Three preparations were prescribed for the first 4 months. 1.Kaishora Guggulu: This formula consists of the following ingredients: Haritaki Fruit (*Terminalia chebula*), Vibhitaki Fruit (*Terminalia belerica*), Amalaki Fruit (*Emblica officinalis*), Guduchi Stem (*Tinospora cordifolia*), Ginger Root (*Zingiber officinale*), Pippali Fruit (*Piper longum*), Black Pepper Fruit (*Piper nigrum*), Vidanga (*Embelia ribes*), Danti Root (*Baliospermum montanum*), Trivruth Root (*Operculina turpethum*), Guggulu Resin (*Commiphora mukul*), The patient was prescribed four 300 mg tablets per day. Two tablets were taken after breakfast

and two tablets after dinner. 2. Triphala : This formula consists of the following ingredients: Haritaki Fruit (*Terminalia chebula*), Vibhitaki Fruit (*Terminalia belerica*), Amalaki Fruit (*Emblica officinalis).* The patient was prescribed three 300 mg tablets per day to be taken after dinner. 3. Custom prepared Herbal Tea blend: This formula consists of the following ingredients: *Coriandrum sativuam* -1TBS, *Cuminum cyminum* -1TBS, *Foeniculum vulgare*- 1 TBS, *Curcuma longa* -1/2 TBS, *Elettaria cardamomum* -1/2TBS.

Kondawar, M. S., K. G. Kamble and D. S. Mali (2011). "Quantitative estimation of gallic acid and ascorbic acid in a marketed herbal medicine: Triphala churna by high performance thin layer chromatography." International Journal of PharmTech Research **3**(3): 1593-1599.

Triphala is an age old commonly used Ayurvedic powdered preparation in Indian systems of medicine. This well known formulation is made by combining Terminalia chebula, Terminalia belerica and Embellica officinalis, in equal proportions. The formulation is prescribed in the first line treatment of many aliments and is used as laxative, detoxifying agent and rejuvenator. Terminalia chebula and Terminalia belerica consist of gallic acid and Embellica officinalis consist of ascorbic acid as marker constituent. A HPTLC-densitometric method of analysis for these markers i.e. gallic acid and ascorbic acid was developed. Water was selected as a solvent for preparing standard solutions. Quantitative estimation of gallic acid and ascorbic acid was performed separately on aluminum backed silica gel 60 F254 TLC plates (10 cm x 10 cm plate size, layer thickness 0.2 mm, E-Merck, Darmstadt, Germany). Ascorbic acid shows Rf value of 0.74 ± 0.1 using ethanol: glacial acetic acid: toluene (5.5:1:1.5) and gallic acid showed Rf value of 0.54 ±0.1, using ethyl acetate: toluene: acetone (4.5:4:1) as mobile phase. The polynomial regression data of ascorbic acid and gallic acid were interpreted separately for its linearity at 500-3500 µg/ml with R2 = 0.9986 and 0.9931 respectively. The literature survey reveals that, there is no such chromatographic method available for quantitative estimation of gallic acid and ascorbic acid.

Koppikar, S. J., S. D. Jagtap, P. P. Devarshi, N. M. Jangle, V. B. Awad, A. A. Wele and A. M. Harsulkar (2014). "Triphala, an Ayurvedic formulation improves the antioxidant status on TNBS induced IBD in rats." European Journal of Integrative Medicine **6**(6): 646-656.

Introduction: Triphala is a well-known Ayurvedic treatment for bowel problems. The aim of the study was to evaluate whether Triphala(an Ayurvedic formulation) can ameliorate excessive oxidative stress and inflammation of intestinal tract in 2,4,6-trinitrobenzene sulfonic acid (TNBS) induced inflammatory bowel disease (IBD)in rats. Materials and methods: Aqueous Triphala extract was assessed for Nitric oxide (NO) scavenging and anti-lipid peroxidation activities. Triphala was orally administered in three doses (330, 500 and 1000. mg/kg/b. wt), where mesalamine remained as control. Activity of MDA, catalase (CAT), superoxide dismutase (SOD) and nitrate-nitrite in colon tissues were estimated using plate-based assays. Gene-expression of CAT, SOD, glutathione peroxidise (GPx) and endothelial nitric oxide synthase (eNOS) were estimated using Real-Time PCR. Lastly, HE staining was used for histopathological observations. Results: NO scavenging revealed 80.00% inhibition at 500 and 1000. µg/ml, whereas complete inhibition of lipid peroxidation obtained at 500 and 1000. µg/ml concentrations. These activities correlated well with reduced oxidative damage (MDA 3.72. µM/g of tissue) after Triphala treatment with significant increase in CAT, SOD and nitrate-nitrite activity in colon. Gene-expression of CAT, SOD and GPx increased in dose-dependent manner, while eNOS expression increased at Triphala 500. mg/kg/b. wt, demonstrating strengthening effect on innate antioxidant defence. Histopathology of colon revealed muco-protection and restoration of normal tissue architecture. Administration of Triphala at 1000. mg/kg/b. wt significantly reduced colonic inflammation measured as reduced colon weight and crypt loss, reduction in infiltration by pro-inflammatory cells and focal necrotic areas in mucosa. Conclusion: Triphala has promising potential for the treatment of IBD given its strong antioxidant effects in reducing inflammation.

Kulkarni, A., P. Chimangude, V. Wagh and A. Kolatkar (2015). "Formulation and evaluation of triphalaguggulkalpa tablets for optimum disintegration time." International Journal of Pharmaceutical Sciences Review and Research **34**(1): 270-275.

Apart from anti-inflammatory and other pharmacological actions, guggul is used as a binder in ayurvedic tablet formulations. Prior to incorporation into formulations, guggul is subjected to shodhana process. Earlier experiments on marketed triphalaguggulkalpa tablets exhibited delayed in vitro disintegration that might be attributed to shodhana of guggul. The study was focused at standardization of triphalaguggulkalpa tablets, an ayurvedic preparation, consisting of guggul. The main objective was to determine the effect of shodhana process on performance characteristics, namely, disintegration time and hardness of tablets. The study was aimed at optimization of the shodhana process. The study involved shodhana of guggul with triphalaquath, preparation of triphalaguglkalpa tablets by direct compression,

and evaluation of the triphalaguggIkalpa tablets. The shodhana process was optimized using 3×2 factorial design. The independent variables were volume of triphalaquath and the contact time of triphalaquath with guggul. The dependent variables were disintegration time and hardness of tablets. The preliminary and factorial batches of triphalaguggulkalpa tablets, having different lots of shodhitguggul, revealed considerable variations in disintegration time and hardness of tablets. Increasing the volume of triphalaquath resulted in higher disintegration time and hardness. The mixing time has a complex role in controlling the tablet hardness and disintegration time. The study determined optimum conditions for guggul (10 gm)- 20 ml of triphalaquath and 20 hour contact time- during shodhana process. The findings provided experimental evidence that shodhana process controlled the binding and disintegrating properties of guggul, in turn controlled the hardness and disintegration of triphalaguggulkalpa tablets.

Kumar, A., S. Baboota, S. P. Agarwal, J. Ali and A. Ahuja (2008). "Treatment of acne with special emphasis on herbal remedies." Expert Review of Dermatology **3**(1): 111-122.

Acne is a cutaneous pleomorphic disorder of the pilosebaceous unit involving abnormalities in sebum production and is characterized by both inflammatory (papules, pustules and nodules) and noninflammatory (comedones, open and closed) lesions. Propionibacterium acnes and Staphylococcus epidermidis are common pus-forming microbes responsible for the development of various forms of acne vulgaris. Common therapies that are used for the treatment of acne include topical, systemic, hormonal, herbal and combination therapy. Topically used agents are benzoyl peroxide, antibiotics and retinoids. Systemically used agents are antibiotics and isotretinoin. These drugs produce a number of potential side effects and devolopment of resistance to frequently used antibiotics. This leads to treatment failure with previously used successful therapy. A variety of ayurvedic drugs, such as Sookshma Triphala, Thiostanin, Sunder Vati and Amalakimashi Vati, are used to treat acne. These are very safe and effective. This review focuses on the use of herbal drugs for the treatment of acne vulgaris that have been found to be very safe and effective.

Kumar, A. and A. K. Garai (2012). "A clinical study on Pandu Roga, iron deficiency anemia, with Trikatrayadi Lauha suspension in children." Journal of Ayurveda and Integrative Medicine **3**(4): 215-222.

Context: Nutritional iron deficiency is the most common cause of anemia in India. The nearest correlation of iron deficiency anemia (IDA) can be made with Pandu Roga in Ayurveda. As the IDA is a very common prevalent disease in the society and the side effects of oral allopathic iron preparations are very common, therefore to get a better alternative, an Ayurvedic herbomineral medicine, the Trikatrayadi Lauha, was subjected to a clinical trial in children suffering from IDA. Trikatrayadi Lauha suspension is an Ayurvedic herbomineral drug. The trial drug contains herbal drugs like Triphala, which is rejuvenative; Trikatu, which is an appetizer; and Trimada, which is digestive. Herbal ingredients in the trial drug may increase the bioavailability of Mandura bhasma and lauha bhasma which are important contents of the formulation. Aim: Evaluation of safety and efficacy of the compound Trikatrayadi Lauha suspension in children with IDA. Settings and Design: Randomized, double-blind placebo-controlled clinical study. Materials and Methods: The study was conducted on 123 children of IDA for a period of 10 weeks. Clinical features and hematological parameters were documented before, during and after treatment. Statistical Analysis Used: Observations of the study were analyzed and findings were evaluated by using statistical methods (Student's t test) Results: The present study shows that the trial drug Trikatrayadi Lauha suspension is effective to improve clinical features and hematological parameters significantly. The medicine is effective to increase the hemoglobin level 1.94 g/dL (8.52 -10.46 g/dL, P < 0.001) in 5 weeks and 3.33g/dL (8.52 - 11.85g/dL, P < 0.001) in 10 weeks. No adverse effect of the trial drug was observed during the study. Conclusions: The results suggest that Trikatrayadi Lauha is significantly effective in the management of IDA in children.

Kumar, M. (2015). "The management of age-related macular degeneration (armd) in ayurvedic prospective-a critical review." International Journal of Ayurveda and Pharma Research **3**(3): 8-12.

Age related macular degeneration a vision threatening disease is a degenerative disease affects man in fifth decade or onward. It is caused by irreversible damage of macula in old and risked patients like arteriosclerosis, smoking, Hypertension, DM etc. In fact ARMD appears to result from a combination of hereditary, environmental, and metabolic factors. The common complaints are difficulty vision in dim light, adaptation in different lighting condition, blurring or blind spot in central vision, and a straight line looks wavy etc. Macular degeneration is of two types –Dry and Wet type in which dry type is more prevalent. Although, macular degeneration is very common with age, Ayurveda advocates certain practice and drug which has proved better to get rid of macular degeneration. The drugs like Triphala, Tulsi, Spirulina,

Punarnava, Shatavari having anti-oxidant and vitamin properties and yellow vegetable like carrot contain carotene are beneficial in ARMD. Drugs like Yastimadhu, Amala, Ginger, Cardamom, Rose, Curcumin etc. has been proven anti-angiogenic properties and are beneficial to prevent neo-vascular age-related macular degeneration (NVAMD). In one study found that Tarpanawith Triphala Ghrita is beneficial and in another study those with the highest dietary intake of lutein had a 57% lower risk for ARMD such as Kale, Spinach, Mustard green, Shatavari, etc.

Kumar, M. S., S. Kirubanandan, R. Sripriya and P. K. Sehgal (2008). "Triphala Promotes Healing of Infected Full-Thickness Dermal Wound." Journal of Surgical Research **144**(1): 94-101.

Background: Infection is a major problem in the management of wounds. Even though the development of synthetic antimicrobial agents persists, drug resistance and toxicity hinder their way. Many plants with multi-potent pharmaceutical activities may offer better treatment options, and Triphala (dried fruits of Terminalia chebula, Terminalia bellirica, and Phyllanthus emblica) are potential formulations evaluated for healing activity on infected wound as it possesses numerous activities. Materials and methods: Alcoholic extract of Triphala has shown in vitro antimicrobial activity against wound pathogens such as Staphylococcus aureus, Pseudomonas aeruginosa, and Streptococcus pyogenes. An ointment was prepared from the Triphala extract (10% w/w) and assessed for in vivo wound healing on infected rat model by rate of healing, bacterial count, biochemical analysis, and expression of matrix metalloproteinases. Results: The treated group has shown significantly improved wound closure. Assessment of granulation tissue on every fourth day showed significant reduction in bacterial count with significant level of collagen, hexosamine, uronic acid, and superoxide dismutase in the treated group ($P < 0.01$). Reduction of matrix metalloproteinase expression observed in the treated group by gelatin zymography and immunoblotting confirms our in vivo assessment. Conclusions: The above results showed the antibacterial, wound healing, and antioxidant activities of Triphala ointment, necessary for the management of infected wounds. Active principles of the Triphala may be further evaluated and used as an excellent therapeutic formulation for infected wounds.

Kumar, M. S., S. Kirubanandan, R. Sripriya and P. K. Sehgal (2010). "Triphala Incorporated Collagen Sponge-A Smart Biomaterial for Infected Dermal Wound Healing." Journal of Surgical Research **158**(1): 162-170.

Background: Wound infection is a major problem in the medical community since many types of wounds are more prone to microbial contamination leading to infection. Triphala (a traditional ayurvedic herbal formulation) incorporated collagen sponge was investigated for its healing potential on infected dermal wound in albino rats. Materials and Methods: Methanol extract of triphala was prepared and analyzed for the presence of catechin by high-pressure liquid chromatography analysis. Collagen sponge was prepared by incorporating triphala into collagen sponge. The triphala incorporated collagen was characterized by Fourier transform infrared spectroscopy, differential scanning calorimetry, and water uptake analysis. Infected wound was dressed with triphala incorporated collagen sponge. Wound reduction rate, collagen content, and matrix metalloproteinases in the granulation tissue, histology, and Fourier transform electron microscopy analysis were done to obtain the healing pattern. Results: High-pressure liquid chromatography analysis showed the presence of (-)epigallocatechin gallate. FT-IR spectroscopy study revealed the interaction of polyphenols with the collagen. Triphala incorporated collagen sponge has shown to increase thermal stability and water uptake capability, faster wound closure, improved tissue regeneration, collagen content at the wound site, and supporting histopathological parameters pertaining to wound healing. Matrix metalloproteinases expression was correlated well with reduction in the inflammatory phase, thus confirming efficacy of the dressing. Conclusions: Better healing efficacy of triphala incorporated collagen sponge may provides a scientific rationale for the use of this dressing as an effective wound cover in the management of infected dermal wound.

Kumar, N. S., A. S. Nair, A. M. Nair and M. Murali (2016). "Pharmacological and therapeutic effects of triphala–A literature review." Journal of Pharmacognosy and Phytochemistry **5**(3): 23-27.

Kumari, K. V., G. Trimurthulu and M. L. Naidu (2012). "Standardization of Dhanvantari Taila: Medicated oil for female infertility." International Journal of Research in Ayurveda and Pharmacy **3**(6): 866-867.

Dhanvantari Taila is an Ayurvedic Herbal Oil prepared from the drugs Balamoola, Dasamoola, Yava, Devadaru, Manjista, Chandana, Sariba, Shilajit, Vacha, Agaru, Punarnava, Aswagandha, Satavari, Yasti, Triphala, Tila Taila and Cow milk etc. The drugs of Dhanvantari Taila are indicated in all vatarogas in various classical Ayurvedic Literatures. This drug acts like Lekhana, Brimhana, Srotoavarodha, Vedanastapana, Sothahara, Vranaropana etc. Based on these properties, oil was prepared with this group of drugs using

Tila Taila as base. This Dhanvantari Taila was selected to study through Uttaravasthi, into uterine cavity on infertility patients including tubal block, Anovulation and Gynecological problems. Before conducting the clinical trails this oil was subjected to certain chemical studies to find out the iodine value, Saponification value, acid value, total fat, weight for ml and HPTLC finger printing for standardization of the drug.

Kumari, N., P. Kumar, D. Mitra, B. Prasad, B. N. Tiwary and L. Varshney (2009). "Effects of ionizing radiation on microbial decontamination, phenolic contents, and antioxidant properties of triphala." Journal of Food Science **74**(3): M109-M113.

Triphala, a mixture of Emblica officinalis, Terminalia chebula, and Terminalia bellirica, containing ingredients from plant origin, is often prone to microbial contamination. A high level of microbial contamination was observed in Triphala samples obtained from different sources. On gamma radiation processing, a sharp decline in log CFU was observed with increasing radiation dose and a complete decontamination at 5 kGy. Average D10 value for total aerobic and fungal counts were observed to be 0.55 ± 0.073 kGy and 0.94 ± 0.043 kGy, respectively. Water extracts of irradiated samples showed linearly increasing concentration of gallic acid (3.3 to 4.5 times), total phenolic contents (2.16 to 2.87 times), and antioxidant properties with increasing radiation dose up to 25 kGy. The increase could be attributed to easy release of active ingredients from their radiation degraded complex forms. Aflatoxin B1 and ochratoxin could not be detected in the samples. Gamma-radiation dose up to 5 kGy could be safely used to hygienize Triphala.

Kuniyal, C. P., V. Purohit, J. S. Butola and R. C. Sundriyal (2013). "Seed size correlates seedling emergence in Terminalia bellerica." South African Journal of Botany **87**: 92-94.

Terminalia bellerica Roxb. (Belleric Myrobalan, Vern. - Baheda, Sanskrit-Vibhitaki, Family: Combretaceae) is among multipurpose tree species in India. The dried pulp of the seeds being used for the preparation of an ancient herbal formulation called Triphala (in Hindi). Seed size is considered a useful attribute for the propagation of valuable trees. The effect of seed size on seedling emergence in T. bellerica was studied under nursery conditions. Emergence of seedlings from large (mean dry weight1.18±0.02 g), medium (0.95±0.03 g) and small seeds (0.76±0.03 g) varied significantly (LSD. Sin p<0.05=4.12, Sin=0.52). Higher numbers of seedlings emerged from the large seeds compared with medium and small seeds. Seed weight also correlated positively with seedling emergence in T. bellerica (r=0.967, significant α =0.01, df=7). Findings of this study will be useful for mass propagation of T. bellerica and reintroduction of elites in different habitats.

Kuriakose, J., H. Lal Raisa, A. Vysakh, B. Eldhose and M. S. Latha (2017). "Terminalia bellirica (Gaertn.) Roxb. fruit mitigates CCl4 induced oxidative stress and hepatotoxicity in rats." Biomedicine and Pharmacotherapy **93**: 327-333.

Terminalia bellirica (Gaertn.) Roxb. is a medicinal plant used for the treatment of various ailments in the traditional system of medicine like Ayurveda where it has been prescribed as a rejuvenator and general health tonic. The fruit of the plant is one of the components of the age old ayurvedic formulation-'Triphala'. The present study evaluates curative effect of aqueous acetone extract of Terminalia bellirica fruits (AATB) against CCl4 induced oxidative stress and liver damage in an animal model. Two doses of the fruit extract (200 mg/kg body weight and 400 mg/kg body weight) were investigated for the beneficial effects. At the end of the treatment, liver function markers (ALT, AST, ALP, GGT, LDH, total bilirubin, total protein, albumin, globulin, albumin-globulin ratio) as well as hepatic oxidative stress markers (SOD, CAT, GSH) were evaluated. Treatment with AATB significantly restored the parameters towards normal level as compared to the elevated biochemical markers in the CCl4 treated animals. Reversal to normal tissue architecture was observed in histological evaluation. The results of AATB (400 mg/kg) were found comparable with that of standard drug silymarin in all the parameters. The above findings suggest the therapeutic potential of the plant in alleviating hepatic oxidative stress and tissue damage, hence the traditional use of the plant in this regard stands justified.

Lalla, J. K., P. D. Hamrapurkar and H. M. Mamania (2000). "Application of HPTLC to alternative medicines - Qualitative and quantitative evaluation of the ayurvedic formulation 'triphala churna'." Journal of Planar Chromatography - Modern TLC **13**(5): 390-393.

Lalla, J. K., P. D. Hamrapurkar and H. M. Mamania (2001). "Triphala churna - From raw materials to finished products." Indian Drugs **38**(2): 87-94.

A widely used ayurvedic preparation, 'Triphala churna' has been prepared using dried fruits of amla, beheda and harda, previously evaluated for their physicochemical characteristics and phytochemical

composition. The churna has been evaluated for extractive values, ash values, phytoconstituents and some physical constants. The results obtained have been compared with similar formulations available in the market employed to establish tests for identification and purity determination.

Latha, S., R. Venkataramanan, R. Srikumar and R. Vijay Kumar (2015). "Effect of triphala on noise stress induced alteration in glucocorticoid and carbohydrate metabolism." International Journal of Pharma and Bio Sciences **6**(2): B655-B662.

Stress is a daily phenomenon faced by every living being and it is essential for learning. The body response to stress involves a fight and flight response in which biological changes, prepares the body for emergency action. The aim of the present study is to find out the fifteen days repeated noise, stress exposure induced alterations in the carbohydrate metabolism and its prevention by treatment with Triphala. Wistar strain male albino rats were used for this study. The result shown that the 15 days repeated noise stress (4hrs/day) increases the plasma cortisol level, adrenal body weight ratio, blood glucose, insulin, liver phosphorylase enzyme activity and decreases liver and muscle glycogen stores, the enzyme glycogen synthase activity. These alterations are prevented by treatment with Triphala during stress exposure. These results suggest that Triphala mixture possess the active compounds that have adoptogenic activity and play important role in maintenance of level of the cortisol and carbohydrate metabolism during stress.

Lavinya, B. U., M. Vedi, S. J. Martin, N. Srilekha, B. S. Kumar, M. Rasool and E. P. Sabinia (2015). "Mitigation of biochemical and histological effects of bromobenzene on the hepatic system in rats by the Indian herbal drug formulation Triphala." Journal of the Indian Chemical Society **92**(4): 566-569.

The present study is ail attempt to evaluate the hepatoprotective and anti-oxidant properties of Triphala against bromobenzene (BB) induced hepatotoxicity in rats. Hepatotoxicity was induced in rats by a single oral dose of BB (10 mmol/kg b.w) on first day of the study. Two different doses (250 mg/kg b.w and 500 mg/kg b.w) of Triphala were administered to the bromobenzene intoxicated rats for 8 days. The standard hepatoprotective drug siiyinarin was used as reference drug for comparison. Bromobenzene treatment resulted in a significant ($p < 0.05$) decrease in the activities of anti-oxidant enzymes; cataiase (CAT), superoxide dismutase <SOD), glutathione-S-transferase (GST), glutathione peroxidase (GPx) and total reduced glutathione (Reduced GSH) levels. There was a significant ($p<0.05$) increase in the levels of total cholesterol, triglycerides, serum bilirubin, and liver functional markers; alanine transaminase (ALT), aspartate transaminase (AST) and alkaline phosphatase (ALP). The administration of two different doses (250 mg/kg b.w and 500 mg/kg b.w) of Triphala in BB-treated rats normalized the tested parameters in a dose dependent manner indicating its hepatoprotective activity. The histopathological examinations of liver sections of the rats support the biochemical observation.

Lu, K., D. Chakroborty, C. Sarkar, T. Lu, Z. Xie, Z. Liu and S. Basu (2012). "Triphala and its active constituent chebulinic acid are natural inhibitors of vascular endothelial growth factor-A mediated angiogenesis." PLoS ONE **7**(8).

Triphala churna (THL) is a combination of three fruits that has been used for many years in India for the treatment of various diseases. There are now reports which indicate that THL can inhibit growth of malignant tumors in animals. However, the mechanisms by which THL mediates its anti-tumor actions are still being explored. Because vascular endothelial growth factor-A (VEGF) induced angiogenesis plays a critical role in the pathogenesis of cancer, we therefore investigated whether tumor inhibitory effects of THL or its active constituents are through suppression of VEGF actions. We herein report that THL and chebulinic (CI) present in THL can significantly and specifically inhibit VEGF induced angiogenesis by suppressing VEGF receptor-2 (VEGFR-2) phosphorylation. These results are of clinical significance as these inexpensive and non-toxic natural products can be used for the prevention and treatment of diseases where VEGF induced angiogenesis has an important role.

Madani, A. and S. K. Jain (2008). "Anti-salmonella activity of Terminalia belerica: In vitro and in vivo studies." Indian Journal of Experimental Biology **46**(12): 817-821.

To search for an herbal remedy for protection against and treatment for typhoid fever, a number of plants were screened. Anti-Salmonella activity of Terminalia belerica, an ingredient of Ayurvedic preparation 'triphala' used for treatment of digestive and liver disorders, has been reported. Fruits of T. belerica were extracted with petroleum ether, chloroform, acetone, alcohol and water and efficacy of extracts against Salmonella typhi and Salmonella typhimurium was evaluated. Alcoholic and water extracts of T. belerica showed significant anti-Salmonella activity and MIC was 12.5 mg/ml against S. typhimurium. Aqueous extracts of Picrohiza kurroa and Vitits vinefera also showed low anti-Salmonella activity where as aqueous extracts of Asparagus racemosus and Zingiber officinale showed no anti-Salmonella activity. Extracts of T.

belerica, Picrohiza kurroa and Vitits vinefera with other solvents such as chloroform and petroleum ether showed insignificant activity. Results showed that aqueous extract of T. belerica was bactericidal at high concentrations where as low concentrations showed bacteriostatic property. In vitro cellular toxicity studies showed no cyto-toxicity associated with T. belerica extracts. Pretreatment of mice with aqueous extract of T. belerica conferred protection against experimental Salmonellosis and 100% survival of animals has been reported when challenged with lethal doses of S. typhimurium.

Mahdihassan, S. (1978). "Triphala and its Arabic and Chinese synonyms." Indian journal of history of science **13**(1): 50-55.

Mahajan, A., L. Sawant, N. Pandita, V. MacHale and N. Pai (2012). "HPTLC densitometric quantification of hydrolyzable tannins from Triphala churna." Journal of Planar Chromatography - Modern TLC **25**(1): 36-41.

A simple high-performance thin-layer chromatographic (HPTLC) method has been established for simultaneous quantification of penta-O-galloyl-β-d- glucose (PGG), tetra-O-galloyl-β-d-glucose (TGG), chebulinic acid, chebulagic acid, and gallic acid from different samples of Triphala churna: TC1, TC2, TC3, TC4, Hirda, Behda, Amla. The method was validated for precision (expressed as coefficient of variation, CV [%]), accuracy, sensitivity, and selectivity. The accuracy of the method was determined by measurement of the recovery at three different concentrations. Average recovery was 98.46% for PGG, 100.02% for TGG, 100.05% for chebulinic acid, 99.79% for chebulagic acid, and 101.15% for gallic acid from Triphala churna. The proposed HPTLC method was found to be simple, precise, selective, sensitive, and accurate for routine quality control of the different samples of Triphala churna containing hydrolyzable tannins.

Mahajan, D. H., M. S. Bhoyar and S. S. Chaudhari (2013). "Efficacy of triphala kwath yoni dhawan with triphala siddha ghrita pratisaran." International Journal of Research in Ayurveda and Pharmacy **4**(2): 249-252.

Episiotomy is the most common operative in obstetrics. Episiotomy wound care is essential as these wounds are difficult to heal. In this study, patients were randomly selected and allotted to trial group and control group, 30 for each group. In trial group triphala Kwatha Yonidhawan and triphala siddha ghrit pratisaran was given for 7 days and in control group patients were treated with perineal wash with Dettol and Betadine ointment locally for 7 days. The result was assessed with selected parameters. At the end of 7 days treatment, trial group showed significant result than control group.

Mahajan, K. N., A. K. Singhai and G. P. Vadnere (2011). "Investigation on anticataract activity of triphala ghrita." E-Journal of Chemistry **8**(3): 1438-1443.

Lab prepared Triphala ghrita was studied for its possible anticataract activity on galactose induced cataract in Swiss albino rats. Administration of Triphala ghrita at a dose of 216 mg/200 g, 1080 mg/200 g, and 2160 mg/200 g of rat orally offered significant dose dependent protection against galactose induced cataract and delayed the onset and progression of cataract. It was seen that the dose of 1080 mg of Triphala ghrita did not show stage II cataract in 14 days and stage III in 21 days. It did not show even stage III and stage IV cataract after 30 days whereas group B and group C showed stage III and stage IV cataracts. Dose of 2160 mg did not showed stage IV cataract after 30 days but showed stage III cataract. Dose of 1080 mg of Triphala ghrita offered significant protection against delaying the onset and progression of cataract in comparison to other doses. This effect may be attributed to the antioxidant activity of gallic acid, ellagic acid and ascorbic acid which shows their presence in Triphala ghrita. This preliminary study was encouraging but further studies are required to extrapolate the clinical usefulness of this formulation.

Mahalakshmi, K., J. Prabhakar and V. G. Sukumaran (2006). "Antibacterial activity of Triphala, GTP & Curcumin on Enterococci faecalis." Biomedicine **26**(3-4): 43-46.

Enterococci, the leading causes of nosocomial bacteremia, surgical wound infection and Urinary-tract infections are becoming resistant to many and sometimes all standard Therapies. Most Enterococcal infections are caused by E faecalis. Enterococci are part of the normal human flora and are usually found in relatively small concentration in the mouth. They are the most frequently isolated species in tooth with persistent infection after root canal treatment. The antibacterial activity of Triphala, GTP and Curcumin were investigated using Disc Diffusion test and Broth dilution. The results obtained showed that Triphala, GTP and Curcumin exhibited antibacterial activities against E faecalis (ATCC 29212). Triphala produced a large zone of inhibition. The minimum inhibitory concentration for Triphala and GTP was 06.25mg/ml. The minimum inhibitory concentration for Curcumin was 12.5mg/ml respectively.

Mahdihassan, S. (1978). "Triphala and its Arabic and Chinese synonyms." Indian journal of history of science **13**(1): 50-55.

Maheswari, K. U., G. Sathyanarayanan and R. Sheeladevi (2014). "Antioxidant activity of Triphala and its individual components - An in-vitro study." Biomedicine (India) **34**(2): 248-251.

Materials and Method: Aqueous extracts of Triphala and its individual fruits were prepared and its antioxidant activity was studied by scavenging assays using DPPH, superoxide anion and nitric oxide by checking for the absorbance in spectrophotometer. Lower absorbance of the reaction mixture indicates higher free radical scavenging activity. The data were compared using SPSS server version 10 and the values are expressed as Mean ±SD. Result: Triphala and its individual components showed effective antioxidant activity from 20ng/ml concentration onwards for DPPH assay and no significant statistical changes seen for superoxide assay. Only 25µg/ml of T. chebula was effective for nitric oxide assay. Conclusion: From these reports it can be concluded that all the components in Triphala is having the ability to quench free radicals. Introduction: Antioxidants become companions to the unpaired electrons of free radicals, thus minimizing the threat of molecular, cellular and tissue damage caused by free radicals. Inspite of various reports about Triphala's antioxidant capability, a drug of equal parts of three medicinal plants namely Terminalia chebula, Terminalia bellerica and Emblica officinalis, no clear in-vitro study for understanding the antioxidant role of its individual components is available. This lacuna forms the basis for this study. Aim: The aim is to find out the anti oxidant potential of Tripala

Malhotra, R., V. Grover, A. Kapoor and D. Saxena (2011). "Comparison of the effectiveness of a commercially available herbal mouthrinse with chlorhexidine gluconate at the clinical and patient level." Journal of Indian Society of Periodontology **15**(4): 349-352.

Background: The key to good oral health is hidden in nature. Natural herbs like neem, tulsi, pudina, clove oil, ajwain, triphala and many more has been used since ages either as a whole single herb or as a combination against various oral health problems like bleeding gums, halitosis, mouth ulcers and preventing tooth decay. The aim of the study was to compare the efficacy of a commercially available herbal mouthrinse (Herboral) with that of chlorhexidine gluconate which is considered to be a gold standard as an anti-plaque agent. Materials and Methods: A randomized, two-group, parallel study as a 'de novo' plaque accumulation model was carried out on 50 subjects (23 males and 27 females). At baseline, all participants received a professional prophylaxis and were randomly assigned to the test (Herbal mouthrinse) and control (Chlorhexidine Gluconate) group. On the following three days, all subjects rinsed with 10 ml of the allocated mouthrinse twice daily for 1 min. They were asked to refrain from use of any other oral hygiene measures during the study. At the end of the experimental period, plaque was assessed and a questionnaire was filled by all subjects. Results: Chlorhexidine (mean plaque score=1.65) inhibited plaque growth significantly more than the herbal mouthrinse (mean plaque score=1.43, $P<0.001$). The results of the questionnaire showed that Herboral was preferred by patients for its taste, its convenience of use and taste duration (aftertaste). However, Chlorhexidine was considered to be more effective in reducing plaque as compared to Herboral. Conclusion: Herbal mouthrinse was found to be a potent plaque inhibitor, though less effective than Chlorhexidine Gluconate. However, it can serve as a good alternative for the patients with special needs as in case of diabetics, xerostomics, and so on.

Mamgain, P., A. Kandwal and R. K. Mamgain (2016). "Comparative Evaluation of Triphala and Ela Decoction With 0.2% Chlorhexidine as Mouthwash in the Treatment of Plaque-Induced Gingivitis and Halitosis A Randomized Controlled Clinical Trial." Journal of Evidence-Based Complementary & Alternative Medicine: DOI: https://doi.org/10.1177/2156587216679532

To evaluate Antigingivitis, Antiplaque and Antihalitosis effect of Triphala and Ela decoction. A randomized sample of 60 patients with plaque induced gingivitis was enrolled and equally divided into two groups group A and group B. Group A was given Trifala and Ela decoction and Group B Chlorehexidine mouthwash for 21 days twice daily. Gingival inflammation index, plaque index and Organoleptic scoring scale was recorded at baseline, 14th day and 21st day. Comparing the plaque index for Group A with group B the reduction in from baseline to 14 day was 42.59 % and 38.62% respectively while from baseline to 21 day was 56.20% and 68.57% respectively. On comparing Gingival index for group A with group B the reduction from baseline to 14 day was 31.95% and 38.62 % respectively while from baseline to 21 day was 69.95 % and 68.57% respectively. Halitosis Percentage reduction at 14th day from base line was 33.33% and 38.18%; at 21 day from baseline 66.66% and 72.72% respectively for group A and group B. No statistical significant difference for intergroup comparison was found using paired t test. Intra group analysis using

unpaired t test was significant for all the indices at different time intervals. Triphala and Ela decoction is organic, easy to prepare economical and equally effective as compared to chlorhexidine mouthwash.

Mamgain, P., A. Kandwal and R. K. Mamgain (2017). "Comparative Evaluation of Triphala and Ela Decoction With 0.2% Chlorhexidine as Mouthwash in the Treatment of Plaque-Induced Gingivitis and Halitosis: A Randomized Controlled Clinical Trial." Journal of Evidence-Based Complementary and Alternative Medicine **22**(3): 468-472.

Present study evaluates efficacy of Trifala and Ela as plaque controlling agent and compares it with chlorhexidine. Aim.: To evaluate Antigingivitis, Antiplaque and Antihalitosis effect of Triphala and Ela decoction. A randomized sample of 60 patients with plaque induced gingivitis was enrolled and equally divided into two groups group A and group B. Group A was given Trifala and Ela decoction and Group B Chlorehexidine mouthwash for 21 days twice daily. Gingival inflammation index, plaque index and Organoleptic scoring scale was recorded at baseline, 14th day and 21st day. Comparing the plaque index for Group A with group B the reduction in from baseline to 14 day was 42.59 % and 38.62% respectively while from baseline to 21 day was 56.20% and 68.57% respectively. On comparing Gingival index for group A with group B the reduction from baseline to 14 day was 31.95% and 38.62 % respectively while from baseline to 21 day was 69.95 % and 68.57% respectively. Halitosis Percentage reduction at 14th day from base line was 33.33% and 38.18%; at 21 day from baseline 66.66% and 72.72% respectively for group A and group B. No statistical significant difference for intergroup comparison was found using paired t test. Intra group analysis using unpaired t test was significant for all the indices at different time intervals. Triphala and Ela decoction is organic, easy to prepare economical and equally effective as compared to chlorhexidine mouthwash.

Manimaran, S., T. Subburaju, S. S. Raja, S. Alok, G. Vaibhav, K. Chinnasamy, M. J. Nanjan and B. Suresh (2003). "Comparative study of gallic acid content in marketed siddha formulations of triphala chooranam and tablets by HPTLC." Indian Drugs **40**(9): 532-534.

The standardization of herbal formulations has become very essential, as there is increase in the demand and use of the herbal formulations. A well known Siddha formulation was standardized for its gallic acid content by High Performance Thin Layer Chromatographic Technique. 50% methanolic extracts of the triphala chooranam and tablets from different manufactures were estimated. These extracts were spotted, developed and scanned at 254nm. The total peak area of standard (Gallic acid) and the corresponding peak area of extracts were compared and the amount in it were calculated. Samples A, B, C (Chooranam), D (Tablets) were taken for the studies.

Marmat, S. and H. S. Rathore (2013). "Cytological effects of triphala in Allium cepa models." International Journal of Pharmacy and Technology **5**(2): 5602-5609.

Triphala (Trifla-means three) is an ancient herbal formulation consisting of dry nuts of Terminalia chebula; Terminalia belleria and Emblica officinalis in equal proportion 1:1:1 wt/wt. In the first protocol its suspension in tap water is used to grow Allium cepa bulbs to find cytological effects on the mitotically dividing root tip cells. At 12.50 mg/l, 25 mg/l and 50 mg/l no effect on mean root length and mitotic index could be seen. At higher concentrations i.e. 100 mg/l, 250 mg/l, 500 mg/l progressive decline in mean root length & mitotic index could be seen. At still higher concentration 1000 mg/l no root growth occurred. No morphological effects could be seen except coloration of tips. No chromosomal aberrations could be seen at any concentrations. In the second protocol A. cepa bulbs with 48 hr grown roots in tap water are further grown for next 24 hr in the above mentioned concentrations of triphala up to 5000 mg/l to see any chromosomal effects at anaphase and telophase but nothing could be seen. At higher concentrations triphala inhibited G1-S transition in both protocols. Triphala is found to lack its own cytotoxicity in both protocols of A.cepa models hence can be tested for its antigenotoxic potential against any substance if used simultaneously as mixture i.e. triphala plus test substance, as one component myrobalan has already been tested.

Maruthappan, V. and K. S. Shree (2010). "Hypolipidemic activity of Haritaki (Terminalia chebula) in atherogenic diet induced hyperlipidemic rats." Journal of Advanced Pharmaceutical Technology and Research **1**(2): 229-235.

Haritaki (Terminalia chebula) family Combretaceae is an important plant used traditionally for medicinal purposes. It is component of the classic Ayurvedic combination called "Triphala". Hyperlipidemia was induced by treated orally with atherogemc diet. In atherogenic diet induced hyperlipidemic model, the rats receiving treatment with Haritaki showed significant reduction in total cholesterol, triglycerides, total protein and elevation of high density lipoprotein cholesterol. Haritaki was found to possess significant

hypolipidemic activity. The results also suggest that Haritaki at 1.05 and 2.10 mg/kg b.wt. concentrations are an excellent lipid-lowering agent.

Mashyal, P., H. Bhargav and N. Raghuram (2014). "Safety and usefulness of Laghu shankha prakshalana in patients with essential hypertension: A self controlled clinical study." Journal of Ayurveda and Integrative Medicine **5**(4): 227-235.

Background: Yoga and Ayurveda texts emphasize the role of cleansing the bowel as an important component of management of hypertension (HTN). Observations during our clinical experience and pilot studies on Laghu shankha prakshalana kriya (LSP), a yogic bowel cleansing technique, appeared to be safe and complimentary. Objective: To test the safety and effectiveness of LSP in patients with essential hypertension. Materials and Methods: This self control study recruited 32 patients with mild to moderate essential HTN admitted for a week long residential integrated yoga therapy program at the integrative health home in Bengaluru. Patients had a daily routine of 6 hours of integrated approach of yoga therapy (IAYT) module for HTN that included physical postures, relaxation sessions, pranayama and meditations. LSP, an additional practice, that involved drinking of luke-warm water (with or without a herbal combination, triphala) followed by a set of specific yoga postures that activates defecation reflex, was administered on 2nd (LSP without triphala) and 5th day (LSP with triphala). Assessments (sitting blood pressure and pulse rate) were done just before and after both the sessions of LSP. Secondary outcome measures such as body mass index (BMI), symptom scores, medication scores, fatigue, state and trait anxiety, general health and quality of life were assessed on 1st and 6th day of IAYT intervention. Results: There was significant (P < 0.001, paired t test) reduction in blood pressure (systolic and diastolic) and pulse rate immediately after both the sessions (LSP with and without triphala). There were no adverse effects reported during or after LSP. There was no significant difference between the two techniques (P < 0.505, independent samples t test), although the percentage change appeared to be higher after triphala LSP session. The number of visits to clear the bowel during the procedure was significantly (P < 0.001, independent samples t test) higher after LSP with triphala than LSP without triphalβ. After weeklong IAYT, there were significant reductions in blood pressure (P < 0.001), BMI (P < 0.004), medication score (P < 0.001), symptoms score (P < 0.001), fatigue (P < 0.001), state and trait anxiety (STAI, P < 0.001), scores of general ill health (GHQ, P < 0.001), and increase in comfort level (P < 0.001) and quality of sleep (P < 0.001). Conclusion: LSP (a part of IAYT) is a safe and useful procedure for patients with essential hypertension. LSP with triphala is more useful.

Maurya, D., N. Mittal, K. Sharma and G. Nath (1997). "Role of triphala in the management of peridontal disease." Ancient science of life **17**(2): 120.

Ayurvedic literature contains a wealth of information on the diagnosis and treatment of periodontal diseases. This article discusses the use of triphala in the treatment of such diseases.

Mayuree, P., M. Carol, B. N. Suhagia and S. R. Acharya (2017). "Qualitative and quantitative estimation of guggulsterone E and Z in different sodhit guggul by LC-MS and HPLC method." Journal of Natural Remedies **17**(3): 96-113.

Objective: Guggul is the oleo-gum-resin obtained from deep incisions at the basal part of stem bark of Commiphora wightii belonging to Burseraceae family. It is very popular ancient Ayurvedic medicine used to cure various diseases. In Ayurveda guggul is always purified prior to use in different formulations. This process is known as sodhana. Guggulsterone E and Z are the prime constituents of Commiphora wightii. The main objective of this study was to identify the impact of guggul sodhana process mentioned in Ayurvedic Formulary of India (AFI) on the content of guggulsterone E and Z. The methanol extract of raw guggul and seven different sodhit guggul were qualitatively and quantitatively analysed by using LC-MS and HPLC methods. The LC-MS specrum indicated the presence of guggulsterone E&Z at m/z-313.2 in all samples with a retention time 4.8 min and 5.7 min respectively. The HPLC chromatogram at 245 nm showed guggulsterone E & Z with same retention time in all samples. The study reports that all the sodhit guggul samples contain guggulsterone E&Z. The water shodhit guggul showed 95.95% of total guggulsterone while triphala shodhit guggul showed 74.21%. It is suggested that sodhana process affects the quantity of guggulsterone E&Z but do not modify its chemical properties.

Mehra, R., R. Makhija and N. Vyas (2011). "A clinical study on the role of Ksara Vasti and Triphala Guggulu in Raktarsha (Bleeding piles)." AYU **32**(2): 192-195.

Shonitarsha is a common affliction which has been described and treated since the beginning of human civilization. Hemorrhoidal cushions are a part of normal anatomy but become pathological when swollen

or inflamed. Treatment of piles in modern medicine is hemorrhoidectomy which results in repeated recurrences. Ayurveda provides a cure and prevents recurrences. Present study was carried out using a combination of Apamarga Kshara Basti and Triphalaguggulu. The results of the clinical assessment of the indigenous formulation on 129 patients with bleeding piles are reported in this paper; 55 patients of a total of 129 showed marked relief. Ingredients of Triphalaguggulu tablets were Emblica officinalis (Amla), Terminalia chebula (Hareetaki), Terminalia bellerica (Vibheetaki), Piper longum (long pepper), and Commiphora mukul (Guggulu). Triphala is well known for its wound-healing quality. It also soothes the inflamed mucous layer and helps in checking the further infection. Guggulu is one of the best known anti-inflammatory herbs of Ayurveda. It also helps in healing the inflammation of fistula-in-ano. Triphala helps in easy bowel movements and relieves the constipation, a problem often troubling the people suffering from hemorrhoids. Piper longum helps in the digestion and assimilation of food nutrients.

Mehrandish, R., A. Rahimian and A. Shahriary (2019). "Heavy metals detoxification: A review of herbal compounds for chelation therapy in heavy metals toxicity." Journal of HerbMed Pharmacology **8**(2): 69-77.

Some heavy metals are nutritionally essential elements playing key roles in different physiological and biological processes, like: iron, cobalt, zinc, copper, chromium, molybdenum, selenium and manganese, while some others are considered as the potentially toxic elements in high amounts or certain chemical forms. Nowadays, various usage of heavy metals in industry, agriculture, medicine and technology has led to a widespread distribution in nature raising concerns about their effects on human health and environment. Metallic ions may interact with cellular components such as DNA and nuclear proteins leading to apoptosis and carcinogenesis arising from DNA damage and structural changes. As a result, exposure to heavy metals through ingestion, inhalation and dermal contact causes several health problems such as, cardiovascular diseases, neurological and neurobehavioral abnormalities, diabetes, blood abnormalities and various types of cancer. Due to extensive damage caused by heavy metal poisoning on various organs of the body, the investigation and identification of therapeutic methods for poisoning with heavy metals is very important. The most common method for the removal of heavy metals from the body is administration of chemical chelators. Recently, medicinal herbs have attracted the attention of researchers as the potential treatments for the heavy metals poisoning because of their fewer side effects. In the present study, we review the potential of medicinal herbs such as: Allium sativum (garlic), Silybum marianum (milk thistle), Coriandrum sativum (cilantro), Ginkgo biloba (gingko), Curcuma longa (turmeric), phytochelatins, triphala, herbal fibers and Chlorophyta (green algae) to treat heavy metal poisoning.

Mehta, B. K., S. Shitut and H. Wankhade (1993). "In vitro antimicrobial efficacy of triphala." Fitoterapia **64**(4): 371-372.

Memarzadeh, E., T. Luther and S. Heidari-Soureshjani (2018). "Effect and mechanisms of medicinal plants on dry eye disease: A systematic review." Journal of Clinical and Diagnostic Research **12**(9): NE01-NE04.

Introduction: Dry Eye Disease (DED) is one of the most common problems and reasons for referring to ophthalmology clinics, which has been exacerbated by the increased use of computers and mobile phones. Aim: The purpose of the present systemic review was to review the effects and mechanism of medicinal plants in DED treatment. Materials and Methods: The key words “Dry eye” or “Keratoconjunctivitis sicca” or “keratitis sicca” in combination with “medicinal plant”, “herb”, and “phyto” were used to conduct the review. Clinical and experimental published articles in English language between 2000-2018 were retrieved from databases including the Institute for Scientific Information (ISI), PubMed and Scopus. Results: Totally, 199 articles were retrieved from the electronic database and finally 17 articles were included in the final analysis. Various plants such as Buddleja officinalis, Aristotelia chilensis, Prunus armeniaca, Hippophae rhamnoides, Lycium barbarum, and Rhynchosia volubilis Lour are effective in treating DED through different mechanisms. Herbal derivatives such as curcumin, antioxidant glasses, phytoestrogen, ferulic acid, and kaempferol can be used as food supplement independently and in some cases along with chemical drugs. Chinese herbal formulations and compounds such as ‘Chi-Ju-Di-Huang-Wan’, ‘TriphalaGhritaNetratarpan’, and ‘ShengJinRunZaoYangXue’ granules can play a role in inducing anti-oxidant and anti-inflammatory properties in the treatment of the disease. Conclusion: Generally, medicinal plants reduce tear film stability by decreasing osmolarity and increasing tear production. Several mechanisms, including the reduction of Reactive Oxygen Species (ROS) (antioxidant activity), the prevention of cell apoptosis, the modulation of inflammatory factors, and the regulation of androgens, can affect lacrimal glands and membrane cells, thereby helping to treat DED.

Mercy, C. I., K. P. Saranya and K. Kala (2011). "Adsorption of chromium from aqueous solutions by Terminalia chebula - A kinetic approach." Indian Journal of Environmental Protection **31**(10): 833-841.

Terminalia chebula (Haritaki), one of the main constituent of Triphala, is widely used as an ayurvedic medicine. Batch adsorption studies reveal that the dried fruit of Terminalia chebula has a significant capacity for the removal of chromium (VI) from aqueous solutions. The effects of various parameters, such as initial metal ion concentration, dosage of adsorbent, contact time, pH of the medium, etc., have been investigated. The percentage of adsorption increased with decrease in initial concentration, decrease in pH, increase in adsorbent-dosage and increase in contact time. The adsorption processes of Cr (VI) were modeled with Langmuir and Freundlich adsorption isotherms. A comparison of kinetic models are also evaluated for the pseudo first order, pseudo second order model and is found that the pseudo second order model fit the experimental data very well. IR and surface morphology analysis indicates that the adsorbent prepared from Terminalia chebula is efficient for Cr (VI) removal from aqueous solutions.

Mishra, P., A. Kumar, A. Nagireddy, A. K. Shukla and V. Sundaresan (2017). "Evaluation of single and multilocus DNA barcodes towards species delineation in complex tree genus Terminalia." PLoS ONE **12**(8).

DNA barcoding is used as a universal tool for delimiting species boundaries in taxonomically challenging groups, with different plastid and nuclear regions (rbcL, matK, ITS and psbA-trnH) being recommended as primary DNA barcodes for plants. We evaluated the feasibility of using these regions in the species-rich genus Terminalia, which exhibits various overlapping morphotypes with pantropical distribution, owing to its complex taxonomy. Terminalia bellerica and T. chebula are ingredients of the famous Ayurvedic Rasayana formulation Triphala, used for detoxification and rejuvenation. High demand for extracted phytochemicals as well as the high trade value of several species renders mandatory the need for the correct identification of traded plant material. Three different analytical methods with single and multilocus barcoding regions were tested to develop a DNA barcode reference library from 222 individuals representing 41 Terminalia species. All the single barcodes tested had a lower discriminatory power than the multilocus regions, and the combination of matK+ITS had the highest resolution rate (94.44%). The average intra-specific variations (0.0188±0.0019) were less than the distance to the nearest neighbour (0.106±0.009) with matK and ITS. Distance-based Neighbour Joining analysis outperformed the character-based Maximum Parsimony method in the identification of traded species such as T. arjuna, T. chebula and T. tomentosa, which are prone to adulteration. rbcL was shown to be a highly conservative region with only 3.45% variability between all of the sequences. The recommended barcode combination, rbcL+matK, failed to perform in the genus Terminalia. Considering the complexity of resolution observed with single regions, the present study proposes the combination of matK+ITS as the most successful barcode in Terminalia.

Mohammad, K. and B. Larijani (2013). "A systematic review of the antioxidant, anti-diabetic, and anti-obesity effects and safety of triphala herbal formulation." Journal of Medicinal Plants Research **7**(14): 831-844.

Triphala (TPL) is one of the oldest used polyherbal preparations. It is comprised of Terminalia chebula, Terminalia bellerica and Emblica officinalis. A variety of uses, such as anti-obesity, of TPL have been described in Ayurvedic and Al-Qanoon Felteb literature. This study focuses on the efficacy and safety of triphala in medicines, with any outcome in humans and animals; and described some of the mechanisms responsible for the many effects of this traditional medicine and main phytochemical analysis. The databases searched include Google Scholar, PubMed, Web of Science, the search terms were "TPL" and "trifala" without narrowing or limiting search elements. The benefits of TPL in vivo and in vitro include: antioxidant, anti-hypercholesterolemic, anti-diabetic, anti-obesity, chemo-preventive potential and anti-mutagenic activity, anti-inflammatory, antimicrobial, radioprotective effect, immunomodulatory, improving wound healing, enteroprotective efficacies, anti gastric ulcers and nitric oxide scavenging activity. This herbal combination can have profound healing benefits in multi-organ systems. And, it exhibits a number of health benefits like antioxidant activity, lowers cholesterol. It is rich in Mg, K, Ca, Fe, Se and Zn, which enhance their bioavailability. TPL may be potent therapeutic agents for scavenging of NO and thereby help to explain, rejuvenating, adaptogenic, cardioprotective and neuroprotective activities of these traditional, and clinically used non toxic drugs.

Momin, M., A. F. Amin and K. Pundarikakshudu (2004). "Development and evaluation of triphala formulations." Indian Journal of Pharmaceutical Sciences **66**(4): 427-432.

The objective of the present study was to develop formulations of Triphala. Tablet formulations were developed using wet granulation and direct compression techniques. With a view to reduce the total dosage size and to incorporate more amounts of actives, it was decided to develop formulations

containing alcoholic extract of Triphala. Addition of different diluents like, di-calcium phosphate, lactose, microcrystalline cellulose and co-crystallized lactose- microcrystalline cellulose were studied for improving the flowability and compressibility. Binders such as starch paste and alcoholic polyvinyl pyrrolidone were used for optimization of the formulation. Dried starch powder was used as a disintegrating agent. Pre and post formulation parameters were studied for all the batches. Co-crystallized lactose-microcrystalline cellulose and alcoholic polyvinyl pyrrolidone proved to be the best diluent and binder, respectively. The results showed that direct compression method is a better alternative technique than wet granulation since it minimizes the processing steps involved in the tabletting. Tablets of Triphala powder showed high friability compared to tablets of Triphala extract. In the dissolution study also Triphala extract tablets exhibited better performance, 95% of total tannins were released. This study suggests that Triphala extract tablets are superior to triphala powder tablets due to higher actives, ease of formulation, elegance and dissolution performance.

Momin, M. and K. Pundarikakshudu (2005). "Optimization and pharmacotechnical evaluation of compression-coated colon-specific drug delivery system of triphala using factorial design." Drug Development Research **65**(1): 34-42.

The purpose of the present investigation was to achieve successful delivery specifically to the colon using guar gum as a compression coat over a core tablet of triphala. In this study, guar gum along with hydroxy propyl methyl cellulose (HPMC) was used as a compression-coating polymer. The drug delivery system was based on the gastrointestinal transit time concept, assuming colon arrival time to be 6 h. Rapidly disintegrating core tablets containing 100-mg triphala extract were compression coated with guar gum and HPMC. A 32 full factorial design was applied for optimization of the formulation. Both variables, the proportion of guar gum in polymer blend (X1) and coat weight of the tablet (X2), had an influence on the percent drug release after 4 h of dissolution of tablet in the presence of rat cecal content (Y240) and difference in percent drug release between 4 h and 10 h of dissolution of tablet in the presence of rat cecal content (YD). The results revealed that for protecting the rapidly disintegrating core of triphala in the physiological conditions of stomach and upper intestine, the core tablet should be coated with 50% of guar gum in coat formulation and higher coat weight. The proportion of guar gum exhibited predominant action as compared to coat weight. In vivo performance was assessed via an x-ray roentgenography study by placing barium sulfate as an x-ray opaque material instead of triphala. The guar gum-HPMC coating was found to be a promising drug delivery system for drugs such as triphala and sennosides to be delivered to the colon.

Momin, M., K. Pundarikakshudu and S. Nagori (2008). "Design and development of mixed film of pectin: Ethyl cellulose for colon specific drug delivery of sennosides and Triphala." Indian Journal of Pharmaceutical Sciences **70**(3): 338-343.

The present study was aimed at developing colon specific drug delivery system for sennosides and Triphala. These drugs are reputed Ayurvedic medicines for constipation in India. The proposed device explored the application of pectin and ethyl cellulose as a mixed film for colon specific delivery. This mixed film was prepared using non-aqueous solvents like acetone and isopropyl alcohol. A 32 factorial design was adopted to optimize the formulation variables like, ratio of ethyl cellulose to pectin (X1) and coat weight (X2). The rate and extent of drug release were found to be related to the thickness and the ratio of pectin to ethyl cellulose within the film. Statistical treatments to the drug release data revealed that the X1 variable was more important than X2. Under simulated colonic conditions, drug release was more pronounced from coating formulations containing higher proportions of pectin. The surface of the device was coated with Eudragit S100 to ensure that the device was more pH dependent and trigger the drug release only at higher pH. The final product is expected to have the advantage of being biodegradable and pH dependant. This type of a film effectively releases the drug while maintaining its integrity.

Mouriya, N., A. Valvi, R. Athawale and N. Bhatt (2017). "Design development and evaluation of triphala tablets." Journal of Complementary and Integrative Medicine **14**(2).

Triphala is a combination of three herbs amla, bahera and haritaki, it is widely available in the form churna and is a valued formula since ancient times. The aim of this research was to develop reproducible batches of triphala tablets and evaluation of the optimized batch. Direct compression was the method of choice. The tablets were prepared using different directly compressible excipients MicroceLac, Ludipress, Ludiflash. High Performance Liquid Chromatography (HPLC) method was employed for authentification of the herbs using gallic acid as the marker. The tablets were evaluated as per the pharmacopoeial tests. The tablets each weighing 600mg were successfully formulated fulfilling the limits of evaluation.

Muguli, G., V. Gowda, V. Dutta, A. Jadhav, B. Mendhe, R. Paramesh and U. Babu (2015). "A contemporary approach on design, development, and evaluation of Ayurvedic formulation - Triphala Guggulu." AYU (An international quarterly journal of research in Ayurveda) **36**(3): 318-322.

Introduction: Ayurvedic texts describe many formulations for different ailments. Triphala Guggulu (TG) is reputed for treating inflammatory conditions. These formulations have been considered complementary medicine or alternative to conventional medicines across the globe. These complex polyherbal formulations need science-based approach toward manufacturing process and chemical standardization. Aim: To evaluate TG tablets to meet modern pharmaceutical approaches and also standardization processes. Materials and Methods: Shodhana of Guggulu was performed using Triphala Kwatha (decoction) as mentioned in ayurvedic texts. This processed material was dried using spray drying technique, blended with other herbal powders as per formula and using suitable excipients was incorporated for compressing into tablets. Excipients and their concentrations were evaluated for various micromeritic properties and the formula that met the requirements was compressed. Results: The angle of repose was considered fair with a range of 25–30, Carr's index at a range between 17 and 30, and Hausner ratio of 1.21:1.44, which was well within the limits as per the United States Pharmacopeia (USP) and among the three blends tested, blend Triphala Guggulu formulation-3 was found most suitable for tablets compression. Physical properties were well within the limits as per the USP and disintegration time was within 30 min. Conclusion: Modern pharmaceutical processing can very well be adapted for Guggulu preparations.

Mukherjee, P. K., R. K. Harwansh, S. Bahadur, S. Biswas, L. N. Kuchibhatla, S. D. Tetali and A. S. Raghavendra (2016). "Metabolomics of medicinal plants-a versatile tool for standardization of herbal products and quality evaluation of Ayurvedic formulations." Current Science **111**(10): 1624-1630.

Secondary metabolites from plants provide lead molecules for drug development. Metabolomics is a modern omic-technique for comprehensive analysis of phytochemicals. Advances in mass spectrometry (MS) based platforms like GC-MS and LC-MS, helped in separation and identification of several metabolites. Such analysis can be a valuable tool for identifying potential biomolecules from medicinal plants. Despite the potential use, metabolomics data of Indian medicinal plants and spices are extremely limited. Similarly, metabolomic studies on Ayurvedic formulations, e.g. Triphala/ Trikatu, are lacking. Our review emphasizes the importance of metabolomics of Indian medicinal plants, crucial for quality evaluation and scientific validation of herbal products.

Mukherjee, P. K., S. Rai, S. Bhattacharya, A. Wahile and B. P. Saha (2008). "Marker analysis of polyherbal formulation, Triphala - A well known Indian traditional medicine." Indian Journal of Traditional Knowledge **7**(3): 379-383.

Triphala is one of the ages old; most commonly used polyherbal preparation in Indian System of Medicine (ISM) particularly in Ayurveda. A rapid, simple, and accurate method with high performance thin layer chromatography (HPTLC) has been developed to standardize Triphala and its individual component using gallic acid (GA) as analytical marker compound. Methanol extracts of Triphala, Emblica officinalis, Terminalia chebula and Terminalia belerica were used for HPTLC on silica gel plates. The Rf of GA was found to be 0.80 with densitometric scanning at 254 nm and the calibration plot was linear in the range of 400 ng to 1800 ng of GA. The correlation coefficient, 0.999, was indicative of good linear dependence of peak area on concentration. The GA content in Triphala with its individual constituents like Emblica officinalis, Terminalia chebula and Terminalia belerica, was found to be 14.38, 17.50, 16.60 and 11.92 mg g-1. This method permits reliable quantification of GA with good resolution and separation of the same from other constituents of extracts of Triphala and its constituents. Recovery values from 96.86 to 98.71% showed the reliability and reproducibility of the method. The proposed HPTLC method for quantitative monitoring of GA in Triphala and its constituents can be used for routine quality testing and similar methods can be developed for other herbal formulations.

Mukherjee, P. K., S. Rai, S. Bhattacharyya, P. K. Debnath, T. K. Biswas, U. Jana, S. Pandit, B. P. Saha and P. K. Paul (2006). "Clinical study of 'Triphala' - A well known phytomedicine from India." Iranian Journal of Pharmacology and Therapeutics **5**(1): 51-54.

Triphala' is an age old commonly used Ayurvedic powdered preparation in Indian systems of medicine. This well known formulation is made by combining Terminalia chebula, Terminalia belarica and Emblica officinalis, in equal proportions based on the observation of Ayurvedic Formulary of India (AFI). The formulation is prescribed in the first line treatment of many aliments and is used as laxative, detoxifying agent and rejuvenator. To establish its clinical validity the present work was undertaken to evaluate its

therapeutic potentials and adverse effects. The Triphala formulation was standardized by HPTLC (High Performance Thin Layer Chromatography), using Gallic acid as a marker and was subjected to clinical studies. After proper screening 160 patients of age between 16-52 years were selected for 45 days clinical study. The effectiveness of trial drugs were judged on the basis of the subjective and objective parameters. It was observed that the amount, frequency and consistency of stool were improved in Triphala treated group. The changes of odor, mucous, flatulence, belching and abdominal pain where also taken into account. The well being was assessed on the basis of the parameters like concentration, appetite, thirst, sleep, hyperacidity in arbitrary scoring system. Triphala was found to have good laxative property, help in management of hyperacidity and also improve appetite. No adverse effect was observed in the treated group when compared to normal patients. Triphala can be used effectively in the treatment of constipation and other gastric problems.

Munshi, R., S. Bhalerao, P. Rathi, V. V. Kuber, S. U. Nipanikar and K. P. Kadbhane (2011). "An open-label, prospective clinical study to evaluate the efficacy and safety of TLPL/AY/01/2008 in the management of functional constipation." Journal of Ayurveda and Integrative Medicine **2**(3): 144-152.

Functional constipation is one of the most common gastrointestinal symptoms across the globe. Its high prevalence rate, economic burden, and adverse implications on the quality of life make constipation a major public health issue. Though various treatment options are available for the management of constipation, evidence for their efficacy and safety are limited. An open-label, prospective, interventional, and exploratory clinical trial was carried out to evaluate the efficacy and safety of "TLPL/AY/01/2008" in 34 patients suffering from functional constipation. "TLPL/AY/01/2008" is an Ayurvedic proprietary polyherbal formulation in powder form, containing Isabgol husk, Senna extract, and Triphala extract. Administration of "TLPL/AY/01/2008" for 14 days showed a significant increase in mean weekly bowel movements from 10.19 ± 05.64 to 18.29 ± 05.72 ($P<0.05$). The mean average time spent on toilet for bowel evacuation reduced significantly from 11.02 ± 05.43 minutes (baseline value) to 08.70 ± 04.72 minutes on day 14 ($P<0.05$). Mean stool form score assessed on Bristol stool form scale was improved from 02.97 ± 00.48 (baseline value) to 04.61 ± 00.84 ($P<0.05$) on day 14. A significant improvement ($P<0.05$) was also noted in straining during defecation, sensation of incomplete evacuation, sensation of anorectal blockage, and other associated symptoms of functional constipation. The significant improvement in most of the above symptoms was endured for a post-treatment observatory period of one week. All the study patients showed an excellent tolerability to the study drug. These findings suggest that "TLPL/AY/01/2008" is an effective, safe, and non-habit-forming herbal laxative formulation for the management of constipation. Comparative clinical studies with larger sample size would be able to confirm the above findings.

Nadkarni, M. A., S. Vyas, M. Baghel and B. Ravishankar (2010). "Randomized placebo-controlled trial of Mustadi Ghanavati in hyperlipidemia." AYU **31**(3): 287.

Hyperlipidemia is one of the major lifestyle disorders. Its role has been appreciated in the manifestation of serious diseases like ischemic heart disease, diabetes, stroke etc. These lifestyle diseases are a result of lifestyle factors such as overnutrition etc., which have been referred to as the Santarpanjanya Vyadhis in the classical texts. Mustadi Ghanavti is a modified form of the classical formulation Mustadi Kwath that has been advocated by Acharya Charaka for the management of Santarpanjanya Vikaras. This placebo-controlled randomized trial of Mustadi Ghanavati (containing many herbs including Triphala) was carried out on 61 patients suffering from hyperlipidemia; of the 61 patients, 50 completed the entire course of treatment. The results of the study revealed that Mustadi Ghanavati decreased serum cholesterol by 22.4%, serum triglycerides by 19.6%, serum LDL by 18.2%, and serum VLDL by 4.2%; serum HDL increased by 5.6%. Thus Mustadi Ghanavati was able to effect a total improvement of 58.8% in the lipid profile. It brought about mild improvement in 42.86% of patients and moderate improvement in 14.28% of patients. Mustadi Ghanavati was also found to have a significant effect on other subjective as well as objective parameters considered for the study. hese drugs relieve the body of excess of Kapha, Meda, Kleda, Vasa, and Sweda by diminishing their Drava Guna. Drugs like Neem, Patha, and Triphala bring about augmentation of the digestive fire, leading to proper formation of the Rasadi Dhatus. Patha, Musta, Triphala, Haridra, and Daruharidra digest the Ama Dosha present at the Jatharagni level as well as the Medodhatvagni level. Also drugs like Triphala and Khadir are Rasayana in nature, leading to the formation of optimal Dhatus, and thereby protect the body from injury due to vitiated Doshas.

Nag, G. and B. de (2011). "Acetylcholinesterase inhibitory activity of Terminalia chebula, Terminalia bellerica and Emblica officinalis and some phenolic compounds." International Journal of Pharmacy and Pharmaceutical Sciences **3**(3): 121-124.

Acetylcholinesterase inhibitors have been extensively used for the symptomatic treatment of Alzheimer's disease. Methanolic extracts of Ayurvedic herbal drug Triphala and the ingredient fruits Terminalia chebula, Terminalia bellirica, and Emblica officinalis were assayed to study their acetylcholinesterase inhibitory properties. All the extracts inhibited the enzyme activity in a dose dependent manner. Gallic acid and ellagic acid, the phenolic acids present in all the fruits, also inhibited the enzyme acetylcholinesterase.

Naik, G. H., K. I. Priyadarsini, R. G. Bhagirathi, B. Mishra, K. P. Mishra, M. M. Banavalikar and H. Mohan (2005). "In vitro antioxidant studies and free radical reactions of triphala, an ayurvedic formulation and its constituents." Phytotherapy Research **19**(7): 582-586.

The aqueous extract of the fruits of Emblica officinalis (T1), Terminalia chebula (T2) and Terminalia belerica (T3) and their equiproportional mixture triphala were evaluated for their in vitro antioxidant activity. γ-Radiation induced strand break formation in plasmid DNA (pBR322) was effectively inhibited by triphala and its constituents in the concentration range 25-200 μg/mL with a percentage inhibition of T1 (30%-83%), T2 (21%-71%), T3 (8%-58%) and triphala (17%-63%). They also inhibited radiation induced lipid peroxidation in rat liver microsomes effectively with IC 50 values less than 15 μg/mL. The extracts were found to possess the ability to scavenge free radicals such as DPPH and superoxide. As the phenolic compounds present in these extracts are mostly responsible for their radical scavenging activity, the total phenolic contents present in these extracts were determined and expressed in terms of gallic acid equivalents and were found to vary from 33% to 44%. These studies revealed that all three constituents of triphala are active and they exhibit slightly different activities under different conditions. T1 shows greater efficiency in lipid peroxidation and plasmid DNA assay, while T2 has greater radical scavenging activity. Thus their mixture, triphala, is expected to be more efficient due to the combined activity of the individual components

Naik, G. H., K. I. Priyadarsini and H. Mohan (2005). "Evaluating the antioxidant activity of different plant extracts and herbal formulations." Research on Chemical Intermediates **31**(1-3 SPEC. ISS.): 145-151.

Aqueous extracts of different medicinal plants, viz., Momardica charantia Linn (E1), Glycyrrhiza glabra (E2), Acacia catechu (E3), Terminalia bellerica (E4), Terminalia chebula (E5) and Emblica qfficinalis (E6), and a combination drug, Triphala (E7), containing equal amounts of E4, E5 and E6, has been evaluated for the antioxidant activity. The methods employed include γ-radiation-induced lipid peroxidation in rat liver microsomes and strand breaks in plasmid DNA. Factors responsible for such activity were examined by phtytochemical analysis and radical scavenging abilities of different extracts. Using pulse radiolysis total antioxidant activities of these extracts were determined and expressed in terms of ascobate equivalents. A good correlation was obtained between antioxidant activity and antioxidant equivalents. The antioxidant activities of the extracts were found to vary as follows: E1 and E2 did not show any antioxidant activity and have very low ascorbate equivalents. E3 acts as a moderate antioxidant, while E4, ES, E6 and E7 are very good antioxidants and are rich in phytochemicals which have high antiradical activity properties.

Naik, G. H., K. I. Priyadarsini and H. Mohan (2006). "Free radical scavenging reactions and phytochemical analysis of triphala, an ayurvedic formulation." Current Science **90**(8): 1100-1105.

In order to understand the factors responsible for the potent antioxidant and radioprotecting ability of triphala, it has been evaluated for radical scavenging ability, xanthine oxidase inhibitory activity and phytochemical (phenolics) content. The radical scavenging experiments were carried out using fast reaction kinetic tools and the reactivity of triphala towards different radicals such as hydroxyl radicals, superoxide radicals, DPPH and ABTS •- was determined. When triphala was tested for superoxide radical scavenging activity using xanthine and xanthine oxidase assay, it was observed that in addition to reacting with superoxide radical, it also inhibited uric acid formation, indicative of xanthine oxidase enzyme inhibitory activity. Phytochemical analysis showed that triphala is rich in phenols/polyphenols (38 ± 3%) and tannins (35 ± 3%), while flavonoids were found to be absent. HPLC analysis showed that triphala contains 73 ± 5 mg gallic acid per gram of triphala, which was found to increase to 150 ± 5 mg/g upon acid hydrolysis. Relevance of these studies to the antioxidant and radio protection properties of triphala has also been discussed.

Naiktari, R. S., C. Dharmadhikari, A. N. Gurav and S. Kakade (2018). "Determining the antibacterial substantivity of Triphala mouthwash and comparing it with 0.2% chlorhexidine gluconate after a single oral rinse: A crossover clinical trial." Journal of Indian Society of Periodontology **22**(6): 498-502.

Context: Triphala has been extensively used in dentistry as a mouthwash because of its antiplaque and antigingivitis properties. Aim: The present study is designed to determine the duration of its antibacterial substantivity after a single oral rinse and to compare it with the substantivity of 0.2% chlorhexidine gluconate (CHX). Materials and Methods: In this clinical crossover trial, unstimulated saliva from 30 individuals was collected 2 h after routine oral hygiene procedures but not rinsing (pre-sample) with randomly selected mouthwash, (10% Triphala mouthwash, 0.2% CHX, and normal saline) and 5 min after rinsing (postsample). A washout period of 1 week was kept between two rinses. The sampling was repeated after every 2 h for 12 h (post 1, post 2, post 3, post 4, post 5, and post 6) and was checked for microbial count. Statistical Analysis Used: Friedman test, Kruskal-Wallis test, and post hoc analysis were used to assess the effect of different mouthrinses on colony forming units at different times. Results: Ten percent Triphala showed statistically significant results when the antibacterial effect at post, post 1 and post 2 were compared to pre-assessment count ($P < 0.05$). After which the effect was at par with normal saline ($P > 0.05$). The results for CHX were statistically significant at all times when compared to pre-assessment count ($P < 0.05$) and it showed the maximum substantivity of 7 h. Conclusion: After a single rinse with no eating and drinking restrictions over the day, 10% Triphala mouthwash had an antibacterial effect for 3-4 h. It can be used three times daily for its maximum antibacterial effect.

Naiktari, R. S., P. Gaonkar, A. N. Gurav and S. V. Khiste (2014). "A randomized clinical trial to evaluate and compare the efficacy of triphala mouthwash with 0.2% chlorhexidine in hospitalized patients with periodontal diseases." Journal of Periodontal and Implant Science **44**(3): 134-140.

Purpose: Triphala is a combination of three medicinal plants, extensively used in Ayurveda since ancient times. Triphala mouthwash is used in the treatment of periodontal diseases because of its antimicrobial and antioxidant properties. The aim of this study is to compare the efficacy of triphala mouthwash with 0.2% chlorhexidine in hospitalized periodontal disease patients. Methods: In this double-blind, randomized, multicenter clinical trial, 120 patients were equally divided into three groups. Patients in group A were advised to rinse their mouths with 10 mL of distilled water, group B with 0.2% chlorhexidine, and group C with triphala mouthwash for 1 minute twice daily for two weeks. The plaque index (PI) and the gingival index (GI) were recorded on the first and the fifteenth day. Results: There was no significant difference when the efficacy of triphala was compared with 0.2% chlorhexidine in hospitalized patients with periodontal disease. However, a statistically significant difference was observed in PI and GI when both group B and group C were compared with group A and also within groups B and C, after 15 days ($P<0.05$). Conclusions: The triphala mouthwash (herbal) is an effective antiplaque agent like 0.2% chlorhexidine. It is significantly useful in reducing plaque accumulation and gingival inflammation, thereby controlling periodontal diseases in every patient. It is also cost effective, easily available, and well tolerable with no reported side effects.

Nair, S. V., A. Arjuman, P. Dorababu, H. N. Gopalakrishna, U. C. Rao and L. Mohan (2007). "Effect of NR-ANX-C (a polyherbal formulation) on haloperidol induced catalepsy in albino mice." Indian Journal of Medical Research **126**(5): 480-484.

Background & objectives: Use of typical antipsychotics like haloperidol in treatment of schizophrenia is associated with a high incidence of extrapyramidal side effects. In rodents, administration of haloperidol leads to the development of a behavioural state called catalepsy, in which the animal is not able to correct an externally imposed posture. In the present study we evaluated the anticataleptic efficacy of NR-ANX-C, a polyherbal formulation containing bioactives of Withania somnifera, Ocimum sanctum, Camellia sinensis, triphala and shilajit in haloperidol induced catalepsy in mice. Methods: Five groups (n = 6) of male albino mice were used in the study. Catalepsy was induced by ip administration of haloperidol (1mg/kg). The degree ot catalepsy (cataleptic score) was measured as the time the animal maintained an imposed posture. We compared the anticataleptic efficacy of NR-ANX-C (10, 25 and 50 mg/kg) with scopolamine (1 mg/kg). The superoxide dismutase (SOD) level in brain tissue was also estimated to correlate the levels of oxidative stress and degree of catalepsy in the animal. Results: Significant ($P<0.01$) reduction in the cataleptic scores was observed in all NR-ANX-C treated groups and maximum reduction was observed in the NR-ANX-C (25 mg/kg) treated group. Significant ($P<0.05$) reduction in SOD activity was observed in NR-ANX-C (25 and 50 mg/kg) treated groups and maximum reduction was observed in NR-ANX-C (25mg/kg) treated group. Interpretation & conclusions: In our study, maximum reduction in cataleptic score was observed in NR-ANX-C (25 mg/kg) treated group. The maximum reduction in SOD

activity was also observed in the same group. These findings suggest a possible involvement of the antioxidant potential of NR-ANX-C in alleviating haloperidol induced catalepsy.

Nair, V., A. Arjuman, H. N. Gopalakrishna, P. Dorababu, P. V. Mirshad, D. Bhargavan and D. Chatterji (2010). "Evaluation of the anti-ulcer activity of NR-ANX-C (a polyherbal formulation) in aspirin & pyloric ligature induced gastric ulcers in albino rats." Indian Journal of Medical Research **132**(8): 218-223.

Background & objectives: The aetiology of gastric ulcers is not completely understood and continuous use of anti-ulcer agents leads to many side effects. In this study we evaluated the anti-ulcer effcacy of a polyherbal formulation with potent antioxidant activity in aspirin and pyloric ligature induced gastric ulcers in rats. Methods: The effcacy of the polyherbal formulation NR-ANX-C (composed of the extracts from Withania somnifera, Camellia sinensis, Ocimum sanctum, shilajith and triphala) was evaluated in terms of antioxidant potential as assessed in terms of protection from lipid peroxidation and the antiulcer activity as seen by the area of gastric lesions, gastric juice volume, gastric pH, total acidity and total adherent gastric mucus content. Results: In our study, NR-ANX-C (25 and 50 mg/kg) was more effcacious than ranitidine in reducing ulcer index in both the models. At the highest dose tested (50 mg/kg), NR-ANX-C was comparable to omeprazole in preventing ulcer formation in the pyloric ligature model. NR-ANX-C showed a dose-dependent decrease in gastric juice volume and total acidity in both the models. A dose-dependent increase in gastric pH and total adherent gastric mucus was also seen in NR-ANX-C treated groups. The extent of lipid peroxidation was also reduced in the test drug treated groups. Interpretation & conclusion: Based on our fndings, we presume that the cytoprotective, anti-secretary and antioxidant properties of NR-ANX-C were responsible for its anti-ulcer activity. These fndings suggest the potential for use of NR-ANX-C as an adjuvant in the treatment of gastric ulcer.

NAIR, V., S. DAS, M. KAR and K. P. DAS (2016). "Triphala in dentistry-a herbal wonder." Journal of Disease and Global Health **7**(4): 164-168.

Nair, V., L. Mohan, U. S. C. Rao and H. N. Gopalakrishna (2011). "Evaluation of the anxiolytic activity of NR-ANX-C (a Polyherbal Formulation) in ethanol withdrawal-induced anxiety behavior in rats." Evidence-based Complementary and Alternative Medicine **2011**.

The present study investigates the anxiolytic activity of NR-ANX-C, a standardized polyherbal formulation containing the extracts of Withania somnifera, Ocimum sanctum, Camellia sinensis, Triphala, and Shilajit in ethanol withdrawal- (EW-) induced anxiety behavior in rats. Ethanol dependence in rats was produced by substitution of drinking water with 7.5v/v alcohol for 10 days. Then, ethanol withdrawal was induced by replacing alcohol with drinking water, 12 hours prior to experimentation. After confirming induction of withdrawal symptoms in the alcohol deprived animals, the anxiolytic activity of the test compound in graded doses (10, 20, and 40mg/kg) was compared to the standard drug alprazolam (0.08mg/kg) in the elevated plus maze and bright and dark arena paradigms. In our study, single and repeated dose administration of NR-ANX-C reduced EW-induced anxiety in a dose-dependent manner. Even though the anxiolytic activity was not significant at lower doses, NR-ANX-C at the highest dose tested (40mg/kg) produced significant anxiolytic activity that was comparable to the standard drug alprazolam. Based on our findings we believe that NR-ANX-C has the potential to be used as an alternative to benzodiazepines in the treatment of EW-induced anxiety.

Nandal, U. and R. Bhardwaj (2015). "Medicinal, nutritional and economic security of tribals from underutilized fruits in Aravali region of district Sirohi, Rajasthan." Indian Journal of Traditional Knowledge **14**(3): 423-432.

Aravali region of district Sirohi is endowed of plant biodiversity with special mention of semi-arid underutilized fruits. The present study emphasized that in ancient times these fruits were largely used by the natives of tribal area as a prime source of natural medicine and food using their traditional wisdom in the form of fresh fruits, dry fruits, fruit juice, fruit powder, arak, chutney, pickle, nutritive wine, drugs, triphala and chyavanprash. However, in present scenario, because of changing food habits, taste and prevalence of several food myths & taboos and unawareness about their importance in daily diet, the new generation of tribals discontinued consuming underutilized fruits. It has resulted into malnutrition among those people who discontinued consuming locally available underutilized fruits along with multiple nutrient deficiency disorders. Significantly, high prevalence of nutrients deficiency and occurrence of clinical symptoms of protein energy malnutrition (14.4%), anaemia (33.0%), iodine deficiency disorder (17.0%), vitamin A deficiency (7.4%), vitamin C deficiency (12.40%), calcium deficiency (18.0%) and zinc deficiency (19.20%) were observed in non-consuming groups of tribals. Whereas the group consuming underutilized fruits regularly was found healthier and nutritionally secure. It was also evident that the

consuming group has more traditional wisdom for therapeutic uses of available underutilized fruits. In addition, the underutilized fruits have the potential to give economic security to tribals by giving employment and by fetching good returns from their sale in raw form as well as value added products.

Nandal, U. and R. L. Bhardwaj (2015). "Medicinal, nutritional and economic security of tribals from underutilized fruits in Aravali region of district Sirohi, Rajasthan." Indian Journal of Traditional Knowledge **14**(3): 423-432.

Aravali region of district Sirohi is endowed of plant biodiversity with special mention of semi-arid underutilized fruits. The present study emphasized that in ancient times these fruits were largely used by the natives of tribal area as a prime source of natural medicine and food using their traditional wisdom in the form of fresh fruits, dry fruits, fruit juice, fruit powder, arak, chutney, pickle, nutritive wine, drugs, triphala and chyavanprash. However, in present scenario, because of changing food habits, taste and prevalence of several food myths & taboos and unawareness about their importance in daily diet, the new generation of tribals discontinued consuming underutilized fruits. It has resulted into malnutrition among those people who discontinued consuming locally available underutilized fruits along with multiple nutrient deficiency disorders. Significantly, high prevalence of nutrients deficiency and occurrence of clinical symptoms of protein energy malnutrition (14.4%), anaemia (33.0%), iodine deficiency disorder (17.0%), vitamin A deficiency (7.4%), vitamin C deficiency (12.40%), calcium deficiency (18.0%) and zinc deficiency (19.20%) were observed in non-consuming groups of tribals. Whereas the group consuming underutilized fruits regularly was found healthier and nutritionally secure. It was also evident that the consuming group has more traditional wisdom for therapeutic uses of available underutilized fruits. In addition, the underutilized fruits have the potential to give economic security to tribals by giving employment and by fetching good returns from their sale in raw form as well as value added products.

Nandhini, T. and R. V. Geetha (2015). "Comparison of the effectiveness of a commercially available herbal mouth rinse with chlorhexidine gluconate at the clinical and patient level." Journal of Pharmaceutical Sciences and Research **7**(8): 595-597.

Oral hygiene is the practice of keeping the mouth clean and healthy by brushing and flossing to prevent tooth decay and gum disease. The purpose of oral hygiene is to prevent the build up of plaque, the sticky film of bacteria and food that forms on the teeth. The removal of plaque is utmost important to control dental caries. The key to good oral health is hidden in nature. Natural herbs like neem, tulsi, pudina, clove oil, ajwain, triphala and many more has been used since ages either as a whole single herb or as a combination against various oral health problems like bleeding gums, halitosis, mouth ulcers and preventing tooth decay. So the aim of the present study is to compare the effectiveness of a herbal mouth rinse with chlorhexidine gluconate mouth rinse at the clinical level in reducing Streptococcus mutans count. A randomized study was carried out on 30 patients who have dental caries. Out of which 15 subjects were given herbal mouthwash to rinse twice a day for five days. The other 15 were given 0.12% chlorhexidine mouthwash to rinse twice a day for five days. Saliva sample were collected prior to the use of mouth wash and after five days and Sreptococcus mutans count was done in terms of colony forming units per ml (CFU/ml). The results of the present study showed that herbal mouthwash can cause inhibition of bacterial growth.

Narayan, A. and C. Mendon (2012). "Comparing the effect of different mouthrinses on de Novo plaque formation." Journal of Contemporary Dental Practice **13**(4): 460-463.

Purpose: Several antiplaque agents are being available in the market in spite of vast development of modern medical science, satisfactory treatment of 'oral diseases' by newer drugs is not fully achieved, rather the chemical compounds has exposed the patients to it is different ill effects, therefore, there is interest to find out effective remedy of any disease by harmless herbal drugs thus the aim of this study was to compare plaque formation at 24 hours after the use of Triphala, Hi ora, Chlorhexidine and colgate plax mouth washes. Methods: A controlled, randomized, double-blind, crossover clinical trial was designed. Thirty subjects underwent four consecutive experimental phases with four treatments: Triphala, Hi Ora, Chlorhexidine and colgate plax. On the day of study, the subjects discontinued all other oral hygiene habits and were randomly assigned for treatment with the experimental mouthwash. Each experimental phase was preceded by a 28- day washout period. Plaque formation was recorded after one undisturbed day. Results: Triphala, Hi Ora and Chlorhexidine reduced de novo plaque formation to a greater extent than the colgate plax mouthwash ($p < 0.05$). Conclusion: Triphala and Hi Ora presents an anti-plaque efficacy similar to that of chlorhexdine, and was more effective at inhibiting plaque formation than the colgate plax mouth wash.

Nariya, M., V. Shukla, S. Jain and B. Ravishankar (2009). "Comparison of enteroprotective efficacy of triphala formulations (Indian Herbal Drug) on methotrexate-induced small intestinal damage in rats." Phytotherapy Research **23**(8): 1092-1098.

Triphala is categorized as a rejuvenator and antioxidant-rich Ayurvedic herbal formulation and has traditionally been used in various gastric problems including intestinal inflammation. The aim of the present study was to examine the comparative enteroprotective effect of Triphala formulations against methotrexate-induced intestinal damage in rats. Triphala formulations were prepared by mixing equal (1:1:1) and unequal (1:2:4) proportions of Terminalia chebula Retz., Terminalia belerica (Gaertn.) Roxb. and Emblica officinalis Gaertn. Intestinal damage was induced by administering methotrexate (MTX) in a dose of 12 mg/kg, orally for 4 days to albino rats. The intestinal damage response was assessed by gross and microscopical injury, measuring the intestinal permeability to phenol red and tissue biochemical parameters. Triphala equal and unequal formulations at the dose of 540 mg/kg significantly restored the depleted protein level in brush border membrane of intestine, phospholipid and glutathione content and decreased the myeloperoxidase and xanthine oxidase level in intestinal mucosa of methotrexate-treated rats. In addition, Triphala unequal formulation showed significant decrease in permeation clearance of phenol red with significant attenuation in the histopathological changes, level of disaccharidase in brush border membrane vesicles and lipid peroxidation content of intestinal mucosa. Based on the data generated, it is suggested that Triphala unequal formulation provides significantly more protection than Triphala equal formulation against methotrexate-induced damage in rat intestine.

Nariya, M., V. Shukla, B. Ravishankar and S. Jain (2011). "Comparison of gastroprotective effects of triphala formulations on stress-induced ulcer in rats." Indian Journal of Pharmaceutical Sciences **73**(6): 682-687.

Triphala is categorized as rejuvenator and traditionally been used in various gastric disorders including intestinal inflammation. The aim of present study was to examine the comparative gastroprotective effects of Triphala formulations against experimental gastric ulcer in rats to substantiate its traditional claim. Gastric ulcer was induced by water immersion plus stress-induced ulcers in rats. The drug effects were assessed by studying macroscopic gross injury and stomach tissue biochemical parameters. Triphala unequal formulation and Chinnodbhavadi kwath showed significant antiulcer activity and this is evident from reduction of ulcer index, lipid peroxidation and hydroxyl radical levels and concomitantly raised levels of catalase and superoxide dismutase. Though similar kind of activity was observed in Triphala equal formulation the magnitude was much less. Further, Chinnodbhavadi kwath significantly increased the glutathione and ATPase level but Triphala equal formulation significantly increased glutathione level only. Based on the data generated, it is suggested that among the three formulations studied, Chinnodbhavadi kwath and Triphala unequal formulations provides significant protection in gastric ulcer as compared to Triphala equal formulation.

Natsume, Y., N. K. Patel, S. M. Tripathi, M. Nose and K. K. Bhutani (2015). "Kalyanaka ghrita: An example of intertextuality among the Bower manuscript, Charak samhita, Susruta samhita, Astangahrdayam samhita and Ayurvedic Formulary of India (AFI)." Indian Journal of Traditional Knowledge **14**(4): 519-524.

This critical and careful study aimed to gather information on the common formulation(s) found in the following ancient medical texts: the Bower Manuscript (Bower Ms.), Charak Samhita (CS), Susruta Samhita (SS), Astangahrdayam Samhita (AHS) and Ayurvedic Formulary of India (AFI). We found that only one formulation, Kalyanaka ghrita, had the same formula in all the texts. Kalyanaka ghrita was prepared according to the formula provided in the AFI and in the ancient classical texts. The prepared ghrita was examined by high performance thin layer chromatography and then compared with commercial Triphala Churna with respect to chemical markers. We identified a connection among the Bower Ms., CS, SS, AHS and AFI.

Neelakantan, P., N. Jagannathan and N. Nazar (2011). "Ethnopharmacological approach in Endodontic Treatment: A focused review." International Journal of Drug Development and Research **3**(4): 68-77.

Endodontic or root canal treatment involved removal of infected tissue and microorganisms from within the root canal space to prevent further infection of the periradicular tissues as well as to allow healing of these tissues. This critical process involves the use of some chemical substances for disinfection of the root canal space. Several studies have shown that contemporary chemical agents [both proteolytic and acidic] do not achieve complete disinfection, and have other disadvantages like weakening of the tooth structure, predisposing to fracture of the tooth. Recently, there has been a growing trend to seek natural remedies as part of dental treatment. This may be termed as ethnopharmacology or phytotherapy. This paper aims at providing a comprehensive review that focuses on the herbal agents that have been evaluated in

endodontics. It also briefly reviews the agents with potential applications in root canal disinfection. The agents reviewed include Morinda citrofolia [Indian Noni], Terminalia chebula [Triphala], Curcuma longa [Turmeric], Glycyrrhiza glabra [Liquorice], Propolis, Melaleuca alternifolia [Tea Tree Oil] and Azadirachta indica A. Juss [Neem].

Odedra, J., A. B. Thakar, N. N. Bhatt, C. R. Harisha and V. J. Shukla (2017). "Pharmacognostical, physicochemical, and high performance thin layer chromatography evaluation of Manjisthadi kwatha in the management of psoriasis." International Journal of Green Pharmacy **11**(1): 57-61.

Background: Manjisthadi kwatha is mentioned in Ayurvedic classics as a therapeutic formulation to treat Kustha, particularly Ekkustha (psoriasis). There is about 2.5% of whole world population today who are suffering from psoriasis but management is till unsatisfactory. Manjisthadi kwatha contains manjistha (Rubia cordifolia), Katuki (Picrorhiza kurroa) and Vacha (Acorus calamus), Guduchi (Tinospora cordifolia), Nimbi (Azadirachta indica), Daruharidra (Berberis aristata) and Triphala. All ingredients of Manjisthadi kwatha having Kushthaghna property. The skin diseases are considered in the umbrella of Kushtha. Thus, it is more effective in Psoriasis internally. Materials and Methods: Manjisthadi kwatha powder was evaluated for their pharmacognostic and pharmaceutical analysis. Results: Microscopic characters were found of Manjistha, Nimbi Vacha, and Guduchi Triphla. Results obtained in pharmaceutical parameters of Manjisthadi kwatha powder such as loss on drying 15.19%, ash value 8.48%, and alcohol soluble extract 58.6% w/v are within limit mentioned by Ayurvedic pharmacopoeia of India. High performance thin layer chromatography profile of Manjisthadi kwatha powder showed similarities in number of spots. Conclusion: From the study, data developed can be espoused for laying down the standards for Manjisthadi kwatha.

Pal, P. K., G. P. Prasad, G. Babu, D. N. S. Gautam and N. K. Singh (2018). "Purification of Guggul by Ayurvedic process (Shodhana), estimation of guggulsterone E & Z before and after purification by HPLC analysis." Indian Journal of Traditional Knowledge **17**(2): 391-395.

Guggul is one of the Ayurvedic product in great demand, used for over thousands of years and high status for its versatile use in several ailments. The two most important pharmacological properties of guggul are its anti-inflammatory and hypolipidaemic actions. The present study was undertaken to find out the effect of three different media of purification (water, cow's urine and Triphala Kashaya (decoction of three myrobalans)) of raw guggul on its markers Guggulsterone E & Z at different heating temperature during Shodhana (purification) process. The guggul purified by different methods was found to be quite variable in reference to physico-chemical parameters and its marker compounds Guggulsterone E & Z by HPLC analysis at similar chromatographic conditions. The Guggulsterone E & Z was found in the order: water > cow's urine > Triphla Kashaya (0.29 w/w, 0.24 w/w and 0.16 w/w, respectively at 85 °C to 95 °C). But the same raw guggul purified with same media like water, cow's urine and Triphala Kashaya at temperature 60 °C to 70 °C showed the presence of high quantity of Guggulsterone E & Z (0.49 w/w, 0.45 w/w and 0.30 w/w for water, cow's urine and Triphala Kashaya, respectively), as compared to the quantity of Guggulsterone E & Z found at temperature 85 °C to 95 °C.

Palav, Y. K. and P. M. D'Mello (2006). "Standardization of selected Indian medicinal herbal raw materials containing polyphenols as major phytoconstituents." Indian Journal of Pharmaceutical Sciences **68**(4): 506-509.

The fruits of Terminalia chebula, Terminalia bellerica and Emblica officinalis are important herbal raw materials containing polyphenols. They form the major constituents of widely used Ayurvedic formulations like Triphala churna. The extracts of these materials were standardized with respect to their total polyphenol contents as determined by Prussian blue method using gum acacia and phosphoric acid as stabilizers. The antioxidant activities were determined by DPPH (1,1-diphenyl-2-picryl-hydrazyl) method and inhibition of lipid peroxide formation induced by Fe2+-ascorbate system. They were found to strongly correlate with total polyphenol contents. The EC50 value (µg/ml) for free radical scavenging activity by DPPH method and IC50 value (µg/ml) for lipid peroxidation inhibitory activity along with the total polyphenol contents can be used as quality control parameters for standardization of herbal raw materials containing polyphenols as major phytoconstituents.

Pandya, K., B. Solanki, K. Maniar, N. Gurav and S. Bhatt (2011). "Natural herbal supplements - an assessment of their nutritional value and their phytochemical constituents." International Journal of Pharma and Bio Sciences **2**(2): 419-438.

Nutritional deficiency is almost impossible to avoid in these modern times, thus supplements help us to overcome the nutritional deficiencies. It also helps us to boost our immune system. Nutritional supplements are also useful in getting rid of the toxins that are accumulated in our body. Thus the five

natural supplements that are mentioned below are tested for the various parameters that include the basic Quality Control Parameters, the phyto chemical analysis, Microbial Analysis that includes the testing for the presence of pathogens along with the total bacterial and fungal count. It is also tested for the presence of heavy metals in them, followed by Aflatoxin and Pesticide analysis. The Nutritional Value for each of them were determined and reported in the form of mg/capsule. The actives of Licorice Capsule Mucuna Capsule and Triphala Capsule were confirmed by the HPLC method where as that of Shatavari was confirmed by the HPTLC Method.

Pandya, M. G. and A. R. Dave (2014). "A clinical study of Punarnava Mandura in the management of Pandu Roga in old age (geriatric anemia)." AYU **35**(3): 252-260.

BACKGROUND: The incidence of anemia rises with age. The consequences of anemia are many and serious, affecting not only individual's health, but also the development of societies and countries. Pandu Roga can be effectively compared with anemia on the ground of its similar signs and symptoms. AIM: To evaluate the Panduhara and Rasayana effect of Punarnava Mandura in the management of Pandu Roga in old age (geriatric anemia). MATERIALS AND METHODS: The study was conducted in 50 clinically diagnosed patients of geriatric anemia. Patients were treated with Punarnava Mandura 2 tablets (250 mg each) twice in a day after lunch and dinner with Takra (butter milk) for 90 days. Among 50 registered patients, 40 patients had completed the treatment and 10 patients discontinued the treatment. Results were analyzed using Wilcoxon signed-rank test for subjective parameters and for assessment of objective parameters paired t-test was adopted. RESULTS: At the end of study, drug has shown beneficial effect in patients of anemia by providing highly significant result in chief complaints, associated symptoms, Kshaya of Dhatu and Agni Bala, Deha Bala and Sattwa Bala. It has also improved quality-of-life (QOL) of the patients. Moderate and mild improvement was observed in 30 and 70% of the patients respectively. CONCLUSION: Punarnava Mandura may work as Rasayana in geriatric anemia by providing highly significant results on clinical features of Pandu Roga, Dehabala, Agni Bala and Sattwa Bala and by improving QOL. of patients of geriatric anemia. According to Ayurvedic literature, most of the drugs in Punarnava Mandura that is Triphala, Trikatu, Chitraka, Vidanga and Pippalimula are having appetizer, digestive and carminative properties. Hence it improves digestive power and ultimately absorption of nutrition and drug also.

Paranjpe, P., P. Patki and B. Patwardhan (1990). "Ayurvedic treatment of obesity: A randomised double-blind, placebo-controlled clinical trial." Journal of Ethnopharmacology **29**(1): 1-11.

Seventy obese subjects were randomised into four groups. Ayurvedic drug including Triphala variations treatments were given for three months while one group received a placebo. Physical, clinical and pathological investigations were carried out at regular intervals. A significant weight loss was observed in drug therapy groups when compared with the placebo. Body measurements such as skin fold thickness and hip and waist circumferences were significantly decreased. Decreases in serum cholesterol and triglyceride levels were observed. No side effects of any kind were observed during the treatment period.

Parveen, R., T. N. Shamsi, G. Singh, T. Athar and S. Fatima (2018). "Phytochemical analysis and In-vitro Biochemical Characterization of aqueous and methanolic extract of Triphala, a conventional herbal remedy." Biotechnology Reports **17**: 126-136.

Triphala, an Indian ayurvedic triherbal formulation, is an equiproportional mixture of fruits of three herbs, amalaki (Emblica officinalis), haritaki (Terminalia chebula) and bibhitaki (Terminalia bellerica). The present study focused on phytocompounds detection and comparative analysis of various biochemical activities in the aqueous and methanolic extracts of triphala and its constituting herbs. Antioxidant activity was determined by 1, 1-diphenyl-2-picrylhydrazyl (DPPH), ferric reducing antioxidant power (FRAP), super oxide dismutase (SOD), catalase assay. Antibacterial potential was determined by broth dilution and agar well diffusion assays. Results revealed the presence of valuable bioactive compounds such as flavonoids, alkaloids, phenols, etc which might be responsible for biochemical activities. Extracts exhibited satisfactory radical-scavenging activity comparable with ascorbic acid. Methanolic extracts demonstrated higher antioxidant activity compared to aqueous extract. Extracts showed promising antibacterial potential against tested strain comparable to ampicillin. Hence, it can be concluded that triphala may be a promising candidate in pharmaceuticals and future medicine.

Patel, D. V., H. Chandola, M. S. Baghel and J. R. Joshi (2012). "Clinical efficacy of Shankhapushpi and a herbo-mineral compound in type-II diabetes." AYU **33**(2): 230.

Diabetic population is more than 245 million worldwide and expected to be b380 million by 2025. One of the main causes of increasing rate of diabetes is stress and tension in day-to-day life, disturbing the homeostasis of positive and negative emotions to initiate pathophysiology of stress-induced diabetes. In the present study, in Group A of 34 patients, a herbo-mineral compound containing Shuddha Shilajatu, Shuddha Guggulu, Vijayasara Ghana, Saptarangi Ghana, and Triphala Ghana was administered in the dose of 3 gm/day in three divided doses with luke-warm water before meal for the duration of 8 weeks, which significantly relieved symptoms (60.52%) like Prabhuta Mutrata (54.55%), Avila Mutrata (66.67%), Daurbalya (61.36%), Shrama (59.32%), etc. with fasting blood sugar (4.05%) and postprandial blood sugar (9.95%). In another series of 34 patients (Group B), where psychological health promoting drug Shankhapushpi was administered in the dose of 1.5 gm/day in three divided doses for 8 weeks along with herbo-mineral compound. The percentage relief was found to be more better on symptoms (71.13%) like Prabhuta Mutrata (76.92%), Avila Mutrata (83.33%), Daurbalya (75%), Shrama (70.37%), fasting blood sugar (18.04%) and postprandial blood sugar (27.75%). Group B showed better results on psychological parameters like disturbed Manasabhava (29.16%) and Brief Psychiatry Rating Scale (38.28%). The high significance of $\chi 2$ (15.50) on overall effect of therapy indicated better results in group B.

Patel, G. K. and S. V. Deo (2016). "Effect of natural organic materials as admixture on properties of concrete." Indian Journal of Science and Technology **9**(37).

Objectives: To study the influence of natural organic materials (i.e. gram-flour, ghee and triphala) as admixture on the durability of concrete. A new method was proposed with 70% loading of average compressive strength to know the durability of concrete under practical conditions. Methods/Statistical Analysis: Use of chemical admixtures in concrete is a common practice in modern construction. Although chemical admixtures improve properties of concrete but also create leaching problem. The paper presents, the various experiments performed to identify the influence of natural organic materials as admixture on durability of concrete. Electrical resistivity, ultrasonic pulse velocity (UPV) and carbonation tests were performed on hardened concrete for 0.4 and 0.45 w/c ratios. Findings: Based on the above results it was found that addition of gram flour provided better durability in terms of electrical resistivity, UPV and carbonation for both the w/c ratios over normal concrete. Even under 70% loading, better durability results were noticed for concrete with gram flour. Although for concrete with ghee and triphala poor results were noticed. Most of the previous work were performed on cement and lime mortar. The present work is performed on the concrete with use of advanced equipment. Application/Improvements: Utilisation of waste food grain causing environmental problems in concrete as admixture in place of chemical admixtures. Research shall discourage use of chemical admixtures in concrete as they are responsible for environmental pollution.

Patel, M. G., V. R. Patel and R. K. Patel (2010). "Development and validation of improved RP-HPLC method for identification and estimation of ellagic and gallic acid in triphala churna." International Journal of ChemTech Research **2**(3): 1486-1493.

Triphala is an anti-oxidant-rich herbal formulation containing fruits of Phyllanthus emblica, Terminalia belerica and Terminalia chebula in equal proportions. The preparation is frequently used in Ayurvedic medicine to treat diseases such as constipation, jaundice, anemia, asthma, fever, chronic ulcers and many more. A simple reverse phase high-performance liquid chromatography (RP-HPLC) method for the separation and quantitative determination of the Gallic acid and Ellagic acid from Triphala has been developed and validated. The use of an RP18 column with a gradient acidic mobile phase enabled the efficient separation of gallic acid and ellagic acid within a 30 min analysis. Validation of the method was performed in order to demonstrate its selectivity, linearity, precision, accuracy and robustness. The proposed RP-HPLC method was found to be simple, precise and accurate and can be used for the quality control of the raw materials as well as formulations.

Patel, M. V., S. Gupta and N. G. Patel (2011). "Effects of Ayurvedic treatment on 100 patients of chronic renal failure (other than diabetic nephropathy)." AYU **32**(4): 329-332.

Chronic renal failure (CRF) refers to an irreversible deterioration in renal function, which develops over a period of years. This initially manifests only as a biochemical abnormality. CRF is considered when glomerular filtration rate (GFR) falls below 30 ml/min. The conventional approach of management includes dialysis and renal transplantation, which are not affordable by Indian population mainly due to economic reasons. Therefore, exploration of a safe and alternative therapy is needed, which proves to be helpful in reducing the requirement of dialysis and in postponing the renal transplantation. A clinical study of 100 patients of CRF was conducted at OPD and IPD of PD Patel Ayurved Hospital, Nadiad. They were given

Niruha basti of Punarnavadi kvatha daily with oral medicaments including Goksuradi guggulu, Rasayana churna, and Varunadi kvatha for 1 month period. Treatment contained Goksuradi guggulu (compound Ayurvedic preparation: Gokshura + Guggulu +Triphala+Trikatu + Musta) 1 g three times a day. Rasayan churna Gokshura + Amalaki + Guduchi in equal quantities) 3 g two times a day. Varunadi kvath (ingredients: Varuna tvak + Bilva moola + Apamarga + Chitrak moola + Arani + Shigru + Bruhati + Kirattikta + Karanja + Shatavari) 10 g two times/day. Niruha basti of Punarnavadi kvatha daily. The patients of CRF, having diabetic nephropathy as a cause, were excluded since a separate study for diabetic nephropathy is being conducted. Results were analyzed statistically using the "t " test. The symptoms and signs, serum creatinine, blood urea, urine albumin level were reduced, which were found to be statistically highly significant on "t " test. With the help of clinical observations and the discussion made, it may be concluded that 86% patients of CRF have hypertension as a basic underlying cause. The result obtained may be attributed to the disease modifying effect of trial therapy by means of its Rasayana and anti Vata-Kapha properties. The trial therapy is an ideal drug as a safe and effective alternative in case of CRF. Serum creatinine, blood urea and albuminuria reduced 20.71%, 32.15% and 36.70%, respectively. Hemoglobin level and urine output increased by 4.38% and 56.54%, respectively. They were statistically highly significant. All the patients have shown more than 50% relief in all the signs and symptoms. In a difficult condition where conventional treatments are beyond the financial capacities of a common man of the country, this therapy can be hopeful and promising.

Patel, S., J. K. Patel and R. K. Patel (2012). "To study proximate analysis & biological evalution of Triphala guggulu formulation." International Journal of PharmTech Research **4**(4): 1520-1526.

Triphala guggulu is one of ayurvedic medicinal preparation is Poly herbal formulation made up of mixtures of five drugs and these drugs contain variety of phytoconstituents. Many scientists agree that if a herbal medicinal product contains several herbal drugs and if it is not possible to perform a quantitative determination of each active substance, the determination may be carried out jointly for several similar active substance. Triphala guggulu may be considered as 'polyherbal medicinal product' made up of multiple numbers of constituents and hence in present investigation major important constitutents were estimated in totality not for any individual markers. The total phenolic content was determined by Folin & ciocalteu's phenol reagent method by UV-spectroscopic method and total flavanoid content were determined by UV-spectroscopic method by using aluminium chloride methods. Herbal antioxidant like triphla guggulu have exhibit significant immunomodulator activity, so that we checked antioxidant activity of triphala guggulu with respective of standard sample of ascorbic acid & we checked the antibacterial activity by cup &plate method.

Patil, P. D., K. Nishteswar, M. B. Nariya and R. S. Ramteke (2015). "Single and compound formulations in the management of Kamala (jaundice) of medieval compendia: A review." PunarnaV **3**(1): 1-14.

Medieval period is known as Madhya Kala (8th to 15th century) of Ayurveda. This period is also known as Sangraha Kala. In this period a number of commentaries on Brihat Trayi and Laghu Trayi were written. The commentators also expressed their own concepts while writing their treaties. Some important compendia on Ayurveda like Siddhayoga Vrindamadhava, Chakradatta, Vangasena, Gadnigraha, Sharangdharasamhita, Rasaratnasammuchaya, etc. were compiled. In the present review, some of the compendia of this era were reviewed with special reference to Kamala. Review is also extended to recent researches on hepatoprotective activity of mentioned drugs. Most of the compendia explained Kamala in Pandu Adhayaya. Single drugs like Amalaki (Emblica officinalis), Guduchi (Tinospora cordifolia), Nimba (Azadirachta indica), Triphala (Emblica officinalis, Terminalia chebula, Terminalia bellirica), Daruharidra (Berbaris aristata), etc. were quoted for the treatment of Kamala. Many of the herbo-mineral preparations like Yogarajrasayana, Manduravatakam, Arogyavardhini etc. are also described in this period. Recent researches have validated the single drug claims and certain classical formulations indicated for their hepatoprotective activity.

Patwardhan, B. and U. Chandran (2015). "Network ethnopharmacology approaches for formulation discovery." Indian Journal of Traditional Knowledge **14**(4): 574-580.

Lifestyle disorders like obesity, diabetes, cardiovascular diseases, and cancers are difficult to manage using one drug-one target approach and so require a multi-targeted approach. Any drug-whether chemical, botanical or biological-will have inherent limitations if it is focused only on a single target when dealing with polygenic syndromes. A new branch known as network pharmacology which integrates systems biology and computational biology has emerged to study drug interactions with multiple targets. Several traditional multi-botanical formulations are widely used globally; however, their rationale and scientific

evidence for pharmacodynamic actions remain insufficient. A systematic study of network ethnopharmacologynetwork pharmacology of medicinal botanicals- is considered as promising approach to understand the scientific basis of intelligent formulations which would facilitate transition from single target based drug discovery to multi-target based rational formulation discovery.This article briefly describesnetwork pharmacology and demonstrates the Rasayana property of Triphalain the light of this emerging technique.

Pawar, N. P. and V. R. Salunkhe (2012). "Development and validation of HPTLC method for simultaneous estimation of rutin and quercetin in hydroalcoholic extract of Triphala churna." International Journal of PharmTech Research **4**(4): 1457-1463.

A new simple, precise, rapid and selective high-performance thin-layer chromatographic (HPTLC) method has been developed for the simultaneous determination of Rutin and Quercetin in Ayurvedic formulations Triphala churna. The retention factors of rutin and quercetin were 0.01 and 0.76, respectively. linearity was obtained in the range of 200-600 ng for Quercetin and Rutin. Methods are validated according to ICH guidelines and can be adopted for the routine analysis of rutin and gallic acid in hydroalcoholic extract of Triphala churna. Satisfactory recoveries of 99.14-99.60% and 98.61-100.56 % were obtained for Rutin and Quercetin. The results obtained in validation assays indicate the accuracy and reliability of the developed simultaneous HPTLC method for the quantification of Rutin and Quercetin in Triphala churna.

Pawar, N. P. and V. R. Salunkhe (2013). "Development and validation of UV spectrophotometric method for simultaneous estimation of rutin and gallic acid in hydroalcoholic extract of Triphala churna." International Journal of PharmTech Research **5**(2): 724-729.

A simple, rapid, accurate, precise, and economic spectrophotometric method for simultaneous estimation of Rutin and Gallic acid in Triphala churna have been developed. Method is based on solving simultaneous equation. rutin and gallic acid show absorbance maximum at 359 and 273 nm respectively, so absorbance was measured at the same wave lengths for the estimation of rutin and gallic acid. Both drugs obey the Beer Lambert's law in the concentration range of 5-30 µg/mL. Methods are validated according to ICH guidelines and can be adopted for the routine analysis of rutin and gallic acid in hydroalcoholic extract of Triphala churna.

Pawar, P., R. Sharma, A. K. Sharma and R. Kumar (2016). Biopesticides and environment. Modern Approaches to Environmental Biotechnology, Nova Science Publishers, Inc.**:** 181-194.

Biopesticides are environmentally sustainable pesticides which are obtained and developed from naturally occurring substances like microbes, plants and biochemicals. They have proven beneficial in agriculture by promoting crop yield. They assist in environmental protection by preventing water and soil pollution, contamination of food and health problems such as cancer unlike chemical pesticides. Their limited usage and biodegradable nature reduces risk of exposure to chemicals, limits water pollution through fertilizer runoff, causes less harm to beneficial pests, and provides better nutritional quality. The total world production of biopesticides is over 3,000 tons/yr, which is increasing at a rapid rate. India has a vast potential for biopesticides. However, its adoption by farmers in India has to be motivated for maximizing gains. Some formaulations developed from neem, garlic, triphala, pinus etc. and biopesticides like Bt, NPV, Trichoderma etc. have been used currently practiced and serve as excellent alternatives to chemical pesticides.

Pawar, V., P. Lahorkar and D. B. Anantha Narayana (2009). "Development of a RP-HPLC method for analysis of Triphala curna and its applicability to test variations in Triphala curna preparations." Indian Journal of Pharmaceutical Sciences **71**(4): 382-386.

A sensitive, rapid, reverse phase HPLC method is reported for analysis of Triphala Curna using gallic acid, chebulagic acid and chebulinic acid as markers. Validation data for the method has been provided. Unlike methods of recovery testing adopted for synthetic chemicals, a modified approach has been presented here for a formulation like Triphala Curna having three myrobalans in its composition. Data has been provided to demonstrate applicability of the method developed to assess the variation in the Triphala Curna preparations.

Peterson, C. T., K. Denniston and D. Chopra (2017). "Therapeutic Uses of Triphala in Ayurvedic Medicine." Journal of alternative and complementary medicine (New York, N.Y.) **23**(8): 607-614.

AIM: The aim of this article is to review the current literature on the therapeutic uses and efficacy of Triphala. Herbal remedies are among the most ancient medicines used in traditional systems of healthcare

such as Ayurveda. Triphala, a well-recognized and highly efficacious polyherbal Ayurvedic medicine consisting of fruits of the plant species Emblica officinalis (Amalaki), Terminalia bellerica (Bibhitaki), and Terminalia chebula (Haritaki), is a cornerstone of gastrointestinal and rejuvenative treatment. METHODS: A search of the PubMed database was conducted. RESULTS: In addition, numerous additional therapeutic uses described both in the Ayurvedic medical literature and anecdotally are being validated scientifically. In addition to laxative action, Triphala research has found the formula to be potentially effective for several clinical uses such as appetite stimulation, reduction of hyperacidity, antioxidant, anti-inflammatory, immunomodulating, antibacterial, antimutagenic, adaptogenic, hypoglycemic, antineoplastic, chemoprotective, and radioprotective effects, and prevention of dental caries. Polyphenols in Triphala modulate the human gut microbiome and thereby promote the growth of beneficial Bifidobacteria and Lactobacillus while inhibiting the growth of undesirable gut microbes. The bioactivity of Triphala is elicited by gut microbiota to generate a variety of anti-inflammatory compounds. CONCLUSIONS: This review summarizes recent data on pharmacological properties and clinical effects of Triphala while highlighting areas in need of additional investigation and clinical development.

Peterson, C. T., V. Sharma, S. Uchitel, K. Denniston, D. Chopra, P. J. Mills and S. N. Peterson (2018). "Prebiotic potential of herbal medicines used in digestive health and disease." Journal of Alternative and Complementary Medicine **24**(7): 656-665.

Introduction: The prebiotic potential of herbal medicines has been scarcely studied. Methods: The authors therefore used anaerobic human fecal cultivation to investigate whether three herbal medicines commonly used in gastrointestinal health and disease in Ayurveda alter the growth and abundance of specific bacterial species. Results: Profiling of cultures supplemented with Glycyrrhiza glabra, Ulmus rubra, or triphala formulation by 16S rDNA sequencing revealed profound changes in diverse taxa in human gut microbiota. Principal coordinate analysis highlights that each herbal medicine drives the formation of unique microbial communities. The relative abundance of approximately one-third of the 299 species profiled was altered by all 3 medicines, whereas additional species displayed herb-specific alterations. Herb supplementation increased the abundance of many bacteria known to promote human health, including Bifidobacterium spp., Lactobacillus spp., and Bacteroides spp. Herb supplementation resulted in the reduced relative abundance of many species, including potential pathogens such as Citrobacter freundii and Klebsiella pneumoniae. Herbal medicines induced blooms of butyrate- and propionate-producing species. U. rubra and triphala significantly increased the relative abundance of butyrate-producing bacteria, whereas G. glabra induced the largest increase in propionate-producing species. To achieve greater insight into the mechanisms through which herbal medicines alter microbial communities, the authors assessed the shifts in abundance of glycosyl hydrolase families induced by each herbal medicine. Herb supplementation, particularly G. glabra, significantly increased the representation and potential expression of several glycosyl hydrolase families. Discussion: These studies are novel in highlighting the significant prebiotic potential of medicinal herbs and suggest that the health benefits of these herbs are due, at least in part, to their ability to modulate the gut microbiota in a manner predicted to improve colonic epithelium function, reduce inflammation, and protect from opportunistic infection. Forthcoming studies in human clinical trials will test the concordance of the results generated in vitro and the predictions made by genome analyses.

Phetkate, P., T. Kummalue, Y. U-Pratya and S. Kietinun (2012). "Significant increase in cytotoxic T lymphocytes and natural killer cells by triphala: A clinical phase i study." Evidence-based Complementary and Alternative Medicine **2012**: Article ID 239856, 239856 pages.

Background. Searching for drugs or herbal formulations to improve the immunity of HIV/AIDS positive people is an important issue for researchers in this field. Triphala, a Thai herbal formulation, is reported to have immunomodulatory effects in mice. However, it has not yet been investigated for immunostimulatory and side effects in healthy human volunteers. Objective. To evaluate the immunostimulatory and side effects of Triphala in a clinical phase I study. Materials and Methods. All volunteers took Triphala, 3 capsules per day for 2 weeks. Complete physical examination, routine laboratory analysis, and immunological studies were performed before ingestion and after initial meeting for 4 consecutive weeks. Results. We found that Triphala demonstrated significant immunostimulatory effects on cytotoxic T cells (CD3−CD8+) and natural killer cells (CD16+CD56+). Both of them increased significantly when compared with those of the control samples. However, no significant change in cytokine secretion was detected. All volunteers were healthy and showed no adverse effects throughout the duration of the study. Conclusion. Triphala has significant immunostimulatory effects on cellular immune response, especially cytotoxic T

cells and natural killer cells. Increases in the absolute number of these cells may provide a novel adjuvant therapy for HIV/AIDS positive people in terms of immunological improvement.

Phimarn, W., W. Caichompoo, B. Sungthong and K. Saramunee (2015). Efficacy of Triphala Formulation on Blood Lipid and Glucose: A Review of the Literature. The International Conference on Herbal and Traditional Medicine, January 28-30, 2015**:** 179-188.

Ponnusankar, S., S. Pandit, R. Babu, A. Bandyopadhyay and P. K. Mukherjee (2011). "Cytochrome P450 inhibitory potential of Triphala - A Rasayana from Ayurveda." Journal of Ethnopharmacology **133**(1): 120-125.

Ethnopharmacological relevance: 'Triphala' is one of the age-old, most commonly used polyherbal preparation from Ayurveda as Rasayana drug. Aim of the study: This study was aimed at evaluating the effect of 'Triphala' on drug modulating enzymes to assess its safety through its potential to interact with co-administered drugs. Materials and methods: The cytochrome P450 inhibitory effect of 'triphala' formulation was investigated on rat liver microsomes using CYP450-CO complex assay and on individual isoform such as CYP3A4 and 2D6 using fluorescence screening. RP-HPLC method was developed to standardize 'triphala' and its individual components using gallic acid as analytical marker compound. Results: RP-HPLC analysis demonstrated the presence of gallic acid (4.30 ± 2.09 mg/g) in the formulation. The formulation showed 23% inhibition of the rat liver microsomes through CYP450-CO complex assay which is comparatively less when compared with the individual components. Further, the effect of standardized formulation dissolved in ethanol showed CYP3A4 and CYP2D6 inhibitory activity at the IC50 values of 119.65 ± 1.91 µg/ml and 105.03 ± 0.98 µg/ml respectively. Gallic acid was also found to inhibit both the isoforms at the IC50 values of 87.24 ± 1.11 µg/ml and 92.03 ± 0.38 µg/ml respectively. Conclusions: Various concentrations of the formulation and its individual components showed significantly less inhibitory activity (p < 0.001) on individual isoforms when compared with the positive control. Assessment on the in vitro effect of 'triphala' on drug modulating enzymes has important implications for predicting the likelihood of herb-drug interactions if these are administered concomitantly.

Poonam, M., G. Sudesh, K. Kirandeep and M. Sharad (2015). "A clinical study to evaluate the efficacy of samangadi ropana taila in the management of dushta vrana (chronic ulcers)." International Journal of Ayurveda and Pharma Research **3**(9).

Chronic ulcers are the problems and challenges for doctors in day today practice. An ulcer is the one of the type of wound which breaks integrity or continuity of skin or mucous membrane. Many studies have been carried out in Ayurveda for the management of chronic ulcers. Shashti Upakrama i.e. sixty types of wound management are the best therapies to deal for chronic ulcers. In the light of Ayurvedic knowledge, Sushruta described Samangadi Ropana taila as topical application in the context of Vrana. It contains Manjishta, Haridra, Padma, Triphala, Tuth, Vidanga, Kutki, Haritaki, Guduchi and Karanja. These drugs have Vrana Shodhana (wound cleaning) and Vrana Ropana (wound healing) properties. The present study was carried out on all types of Dushta Vrana (chronic ulcer). The Taila was applied topically once daily for 30 days or till healing of wound whichever is earlier. In this study 30 patients were selected and the study was single blind clinical study to evaluate the efficacy of Taila by the subjective and objective criteria. This study shown that, there were significant results found in Dushta vrana (chronic ulcer) by anti-infective (anti bacterial, anti-fungal and anti-parasitic) property. It also contains analgesic and anti-inflammatory property which reduces pain, discharge, inflammation, tenderness, burning sensation and itching which contribute healthy granulation tissue formation. Thus wound healing restored without producing any adverse effect.

Prabhakar, J., S. Balagopal, M. S. Priya, S. Selvi and M. Senthilkumar (2014). "Evaluation of antimicrobial efficacy of Triphala (an Indian Ayurvedic herbal formulation) and 0.2% chlorhexidine against Streptococcus mutans biofilm formed on tooth substrate: An in vitro study." Indian Journal of Dental Research **25**(4): 475-479.

Background: Streptococcus mutans is one of the most important cariogenic species of the human oral microbial flora. Biofilm style of microbial growth thought to resist the actions of antimicrobials. Aim: The purpose of this study was to evaluate the antimicrobial efficacy of Triphala, and 0.2% chlorhexidine against S. mutans biofilm formed on tooth substrate. Settings and Design: Randomized control trial. Methods: Extracted human mandibular premolars sectioned below the cemento-enamel junction were placed in the tissue culture wells exposing the crown surface to S. mutans to form a biofilm. At the end of 3 rd and 7 th day, all groups were treated for 10 min with the test solutions and control and were analyzed qualitatively and quantitatively. Statistical Analysis Used: One-way ANOVA. Results: Qualitative assay with 3 days biofilm showed complete inhibition of bacterial growth with Triphala, but 0.2% chlorhexidine and saline

showed the presence of bacterial growth. In quantitative analysis, 0.2% chlorhexidine and Saline treated tooth samples have shown 1052 - 10 4 ± 15.1 - 10 4 CFU/ml, 141.3 - 10 9 ± 2.1-10 9 CFU/ml, respectively. Qualitative assay with 7 days biofilm on crown portion showed dense growth when treated with 0.2% chlorhexidine and saline, whereas Triphala has shown minimal growth. In Quantitative analysis, Triphala showed statistically significant result when compared with 0.2% chlorhexidine and saline. Conclusion: Triphala showed statistically significant antibacterial activity against S. mutans biofilm formed on tooth substrate. The incorporation of Triphala in mouth rinse could prove to be effective in reducing S. mutans count in the oral cavity.

Prabhakar, J., R. Mensudar and N. Geethapriya (2015). "Cleaning efficacy of triphala (An Indian Herbal Medicine) and green tea polyphenol used as irrigants on removal of smear layer: A Sem study." Biomedical and Pharmacology Journal **8SE**: 303-307.

The aim of this study is to compare the cleaning effectiveness of Triphala and Green Tea Polyphenol to 2.5% sodium hypochlorite (NaOCl) solution as an intracanal irrigant for the removal of the smear layer. Forty extracted, single-rooted,mature, permanent, human teeth were allocated at random into one of three experimental groups of ten teeth and two control groups of five teeth. For each tooth, the pulp chamber was accessed and the canal prepared using K-type files and Gates-Glidden burs,using a step-back technique; the apical stop was prepared to a size 40. Each canal was subsequently irrigated with one of the following solutions: distilled water (as a negative control), 2.5% NaOCl + 17% ethylenediamine tetraacetic acid (EDTA) (as a positive control), Triphala or GTP or 2.5% NaOCl. Each tooth was split longitudinally and prepared for examination by scanning electron microscopy (SEM).The quantity of smear layer remaining on the three levels of each canal (coronal, middle and apical) was examined using magnifications of 1000 and 2000·.The data were analysed using nonparametric Kruskal-Wallis and Mann-Whitney U-tests.The most effective removal of smear layer occurred with the use of NaOCl with a final rinse of 17% EDTA (negative control) followed by the use of a Triphala. Triphala was found to be significantly more effective than distilled water and GTP ($P < 0.008$).The use of a 2.5% NaOCl solution alone, without EDTA and that of GTP, was found to have only minor effects. There was no statistical difference between distilled water, 2.5% NaOCl and GTP. The efficacy of Triphala to remove smear layer was superior to NaOCl alone but less than NaOCl combined with EDTA.

Prabhakar, J., M. Senthilkumar, M. S. Priya, K. Mahalakshmi, P. K. Sehgal and V. G. Sukumaran (2010). "Evaluation of Antimicrobial Efficacy of Herbal Alternatives (Triphala and Green Tea Polyphenols), MTAD, and 5% Sodium Hypochlorite against Enterococcus faecalis Biofilm Formed on Tooth Substrate: An In Vitro Study." Journal of Endodontics **36**(1): 83-86.

Introduction: The purpose of this study was to evaluate the antimicrobial efficacy of Triphala, green tea polyphenols (GTP), MTAD, and 5% sodium hypochlorite against E. faecalis biofilm formed on tooth substrate. Methods: Extracted human teeth were biomechanically prepared, vertically sectioned, placed in the tissue culture wells exposing the root canal surface to E. faecalis to form a biofilm. At the end of the 3rd and 6th weeks all groups were treated for 10 minutes with the test solutions and control and were analyzed qualitatively and quantitatively. Results: Qualitative assay with 3-week biofilm showed complete inhibition of bacterial growth with Triphala, MTAD and NaOCl, except GTP and saline, which showed presence of bacterial growth. In quantitative analysis, GTP- and saline-treated tooth samples have shown 1516 ± 17.2 CFU/mL, 156.4 × 109 ± 3.1 × 109 CFU/mL respectively. Qualitative assay with 6-week biofilm showed growth when treated with Triphala, GTP and MTAD whereas NaOCl has shown complete inhibition. All groups except NaOCl showed eight log reduction when compared to control when analyzed quantitatively. Conclusions: 5% sodium hypochlorite showed maximum antibacterial activity against E. Faecalis biofilm formed on tooth substrate. Triphala, green tea polyphenols and MTAD showed statistically significant antibacterial activity. The use of herbal alternatives as a root canal irrigant might prove to be advantageous considering the several undesirable characteristics of NaOCl.

Prabu, D. and R. Sindhu (2018). "Triphala and its efficacy in treating gingival diseases: A systematic review." Journal of International Oral Health **10**(6): 267-271.

Aims and Objectives: The aim of the study is to assess the efficacy of triphala in treating gingival diseases. Materials and Methods: A literature review was performed using Medline, PubMed, Wiley, ScienceDirect, Cochrane Central Register of Controlled Trials (CENTRAL), Scopus, and Grey literature using MeSH terms-Triphala, gingivitis, and dentistry. Of a total of 251 titles appeared from various sources, 243 articles were screened and 27 were related to the research question. This review was reported according to the preferred reporting items for systematic reviews and meta-analyses guidelines. Results: Seven trials were

included and they were all compared with chlorhexidine. Among the seven trials, five found statistically significant differences favoring the effectiveness of triphala mouthwash. No meta-analysis was performed due to the clinical heterogeneity and differences in the reporting of data among the included studies. Conclusion: In the available literature, the multiple beneficial effects of triphala was found to be effective in treating gingival diseases as well as equally effective to the gold standard mouthwash chlorhexidine in improving gingival health.

Pradeep, A. R., D. K. Suke, S. S. Martande, S. P. Singh, K. Nagpal and S. B. Naik (2016). "Triphala, a new herbal mouthwash for the treatment of gingivitis: A randomized controlled clinical trial." Journal of Periodontology **87**(11): 1352-1359.

Background: An antiplaque agent with minimal side effects that can be used as an effective adjunct to mechanical plaque control is needed. The current study is designed to evaluate efficacy of triphala (TRP) mouthwash in reduction of plaque and gingivitis. Methods: Ninety individuals with chronic generalized gingivitis were randomly assigned to three groups: 1) group I, placebo mouthwash; 2) group II, TRP mouthwash; and 3) group III, chlorhexidine (CHX) mouthwash. All individuals were instructed to rinse with their respective mouthwash twice daily. 1) Plaque index (PI); 2) gingival index (GI); 3) oral hygiene index-simplified (OHI-S); and 4) microbiologic colony counts were recorded at baseline and at 7, 30, and 60 days. Results: All three groups showed gradual reduction in PI, GI, and OHI-S levels from baseline to 7, 30, and 60 days. There was also significant reduction in microbial counts in all groups at all time intervals except in group I. A significant difference was noticed with respect to reduction in PI, GI, OHI-S, and microbiologic counts in group I compared with groups II and III. However, no significant differences were found between groups II and III for any parameters at any time intervals. Conclusions: TRP mouthwash was found to decrease inflammatory parameters from baseline to follow-up intervals. Because improvement in gingivitis was comparable with that of CHX mouthwash, TRP mouthwash can be considered a potential therapeutic agent in the treatment of gingivitis.

Prakash, S. and A. U. Shelke (2014). "Role of Triphala in dentistry." Journal of Indian Society of Periodontology **18**(2): 132-135.

Ayurveda is considered as the "science of life," because the ancient Indian system of health care focused views of man and his illness. India has an age-old heritage of traditional herbal medicine. Conventional drugs usually provide effective antibiotic therapy for bacterial infections, but there is an increasing problem of antibiotic resistance and a continuing need for new solutions. Hence, now herbal drugs are being preferred to synthetic antibiotics. 'Triphala' is a well-known powdered preparation in the Indian system of medicine (ISM). It consists of equal parts of the Emblica officinalis, Terminalia chebula, and Terminalia belerica. Currently, Triphala is being extensively researched for its various therapeutic effects including its anti-caries, antioxidant, anti-collagenase, and anti-microbial activities. The present review will focus on the comprehensive appraisal of Triphala and its several applications in dentistry.

Prasad, P. S., J. E. Sam, A. Kumar and K. Kannan (2014). "The effect of 5% sodium hypochlorite, 17% EDTA and triphala on two different rotary Ni-Ti instruments: An AFM and EDS analysis." Journal of Conservative Dentistry **17**(5): 462-466.

Aim: To use Atomic Force Microscope and Energy Dispersive X-ray Spectroscopy to evaluate the effect of 5% NaOCl, 17% EDTA and triphala on ProTaper and iRaCe rotary Ni-Ti instruments. Methodology: A total of eight Ni-Ti rotary files, four files each of ProTaper-S2 (Dentsply) and iRaCe-R3 (FKG DENTAIRE) were used. Three out of four files each from ProTaper and iRaCe were immersed in 5% NaOCl, 17% EDTA and Triphala separately for five minutes. The Roughness average (Ra), Root Mean Square (RMS) and Mean Height of Roughness Profile Elements (Rc) of the scanned profiles were then recorded using AFM and the elemental composition was evaluated with EDS. Data were analyzed by Student's t test, One Way ANOVA and Duncan's Multiple Range Test. Results: Topographic irregularities at the nanometric scale were observed for all files. Files immersed in EDTA and NaOCl showed highly significant surface roughness than untreated files. Conclusion: Short-term contact with 17% EDTA and 5% NaOCl can cause significant surface deterioration of ProTaper and iRaCe rotary NiTi files. AFM proves to be a suitable method for evaluating the instrument surface.

Prativadibhayankaram, V. S., S. Malhotra, P. Pandhi and A. Singh (2008). "Anti-diabetic activity of triphala fruit extracts, individually and in combination, in a rat model of insulin resistance." Natural Product Communications **3**(2): 251-256.

We have investigated the possible antidiabetic properties of fruit extracts of Emblica officinalis Gaertn., Terminalia chebula Retz. and T. bellirica Roxb., individually and in combination (Triphala) in a high fructose diet induced rat model of insulin resistance. In the first part of the study, normal animals were studied for hypoglycemic activity. In the second part, animals were given a high fructose diet (HFD) for 40 days, for the last 20 days of which fruit extracts were also given. Body weight, fasting plasma glucose (FPG), and area under the curve (AUC) of the oral glucose tolerance test (OGTT) were assessed at the baseline, and at days 20 and 40. Fasting plasma insulin levels and the homeostasis model assessment (HOMA) resistance index were also assessed at baseline, 20 and 40 days. Fasting lipid levels were measured at the end of the study. During the first part of the investigation, in which extracts were given to normal animals, T. chebula showed significant hypoglycemic activity. During the second part of the study, in which the extracts were given to HFD fed rats, T. chebula caused a significant decrease in FPG and AUC. Emblica officinalis and Triphala caused a normalization of FPG. T. bellirica caused a reduction in AUC levels, but had no effect on FPG levels. T. bellirica caused a reduction in serum total cholesterol, triglyceride and low density lipoprotein levels. In conclusion, all three components of Triphala showed significant antidiabetic properties. T. bellirica, in addition, showed hypolipidemic activity.

Priyanka, P., M. K. Sanjeev, G. V. Kumar, S. Jitender and Sweety (2014). "Gum guggul: An ayurvedic boom." International Journal of Pharmacognosy and Phytochemical Research **6**(2): 347-354.

'Guggul' a common name for all Commiphora species, is the bioactive oleo-gum-resin responsible for the therapeutic effects. Gum, essential oils, flavonoids, ellagic acid, camphorene, cembrene, diterpene hydrocarbon, diterpene alcohol, Zguggulsterone, E-guggulsterone, guggulsterol-I, II, & III, cholesterol, etc are present. Guggul was introduced as a medicine in 1966, and but approved as a hypolipidemic drug for marketing in India in 1986. Commercially ayurvedic formulations of guggul are Triphala guggulu, Yogaraj guggulu, Kaishor guggulu, Punavadi guggulu, etc. used for detoxification, treating obesity, arthritic conditions, muscle aches, rheumatism, gout, eliminating fluid, helping heart conditions, and inflammations. Now it has been used to treat hypercholesterolemia, impotence, bronchitis, catarrh, sores, tumors, wounds bone fractures, facial paralysis, ulcers, anemia, diabetes, and as a tonic for the uterus, etc. The result from clinical and preclinical studies support the therapeutic claims for gum guggul as mentioned in Ayurveda. However, future clinical studies are required to confirm these claims.

Raghunatha Reddy, K. R., S. N. Vinaya Babu, N. Raghavendra, V. V. Kuber and S. U. Nipanikar (2011). "Acute and 28-day repeated dose toxicity studies with polyherbal formulation of Isabgol husk, Swarnapatri leaf extract and Triphala fruits extract (TLPL/AY/01/2008)." International Journal of Pharma and Bio Sciences **2**(4): 639-652.

The acute and sub-chronic 28-day repeated dose toxicity studies in rodents were performed to assess the safety of polyherbal formulation of Isabgol husk (Plantago ovate), Swarnapatri leaf extract (Cassia angustifolia) and Triphala fruits extract (Emblica officinalis, Terminalia chebula and Terminalia belerica) (TLPL/AY/01/2008). The studies were conducted according to current OECD toxicology guidelines for acute and repeated dose. No mortalities or evidence of adverse effects were observed following acute oral gavage administration up to 2000 mg/kg of TLPL/AY/01/2008 in Sprague dawley rats. The 28-day repeated dose study involving daily oral administration of 70, 175 and 350 mg/kg body weight of TLPL/AY/01/2008, with a post trial 14 day no treatment observation period at high dose level, resulted in no clinical signs and animal deaths. No toxicological significant differences were observed in any of the TLPL/AY/01/2008 treatment groups for body weights, feed consumption, physical appearance, neurological behaviour and urine analysis. Evaluation of haematology and clinical chemistry parameters revealed no toxicological and treatment related effects. No treatment related changes noted in absolute and relative organ weights. Macroscopic and microscopic evaluation of organs revealed no treatment related. Results of this study demonstrate that polyherbal formulation TLPL/AY/01/2008 is not acutely toxic at 2000 mg/kg of body weight/day, with a NOAEL (no-observed-adverse-effect-level) of greater than 350 mg/kg of body weight/day for systemic toxicity from repeated dose 28-day oral gavage administration. The present study demonstrates the non-adverse nature of the polyherbal formulation TLPL/AY/01/2008 on long term administration.

Rai, P., V. M. Gupta, R. Pathak, L. N. Gupt, N. Kumar and R. S. Singh (2010). "Importance of media in the pharmaceutical processing's of metals and minerals - scanning electron microscopy study and energy dispersive x-ray analysis of abhraka (Biotite)." International Journal of Pharmacy and Pharmaceutical Sciences **2**(SUPPL. 4): 121-123.

Shodhana is an important intermediately pharmaceutical process during conversion of metals and minerals into bhasma (ash). Different media are described for the shodhana process of abhraka (Biotite).

Shodhana of abhraka was done in the specific mediums i.e. cow-milk, cow-urine, decoction of triphala and badari separately. To find out the significance of these media, scanning electron microscopy study and energy dispersive x-ray analysis of abhraka was carried out. Field emission scanning electron microscopy (FESEM) study reveals that the plate late structure of abhraka not only remains intact but also became more granular and appears to be microcrystalline along with reduction in particle size after shodhana process. Energy dispersive x-ray analysis (EDAX) reflects the compositional variations of elements.

Rai, P., N. Kumar, R. S. Singh, R. Pathak and L. N. Gupta (2010). "Standardization of abhraka shodhana - A pharmaceutical study." Biomedical and Pharmacology Journal **3**(1): 225-228.

The use of metals and minerals for therapeutic purpose are very common in Ayurvedic system of medicine. Shodhana is the initial step with objective to remove impurities and detoxify the material and so make them suitable for further processing. Nirvapa is very important step of shodhana process for the metal having high melting point in which the material is heated to red hot stage and then quenched into a liquid medium such as cow milk, decoction of triphala, etc. In the present study, shodhana of abhraka (biotite) was done using standard procedure. Raw abhraka was divided into 3 batches and the pharmaceutical study of shodhana process was done. It was found that abhraka attained red hot stage at around 823°C after 55 minutes of heating. Approximately 6 hour is required for seven time nirvapa of abhraka. Solid content and alkalinity of the cow - milk was increased after shodhana process.

Raina, A., A. Bhardwaj and A. Sharma (2017). "Pain management after kshar-sutra ligation of haemorrhoids with herbomineral preparation and standard NSAID: A contrastive study." AYUSHDHARA **3**(3): 702-706.

The disease haemorrhoids is an Ano-rectal disorder and is as old as mankind. A large population of the world population is troubled with this disease which is due to inconsistency of the human diet and social obligations demanded by civilization. The management of 3rd degree haemorrhoids needs mainly a surgical approach. The Kshara-sutra ligation method of haemorrhoids is done by Ayurvedic surgeons but facing hardships in post ligation pain management. A complete Ayurvedic postoperative pain management is the need of every Ayurvedic surgeon. This study was carried out with an attempt to find an effective and safe Ayurvedic postoperative pain management and for this, 30 Patients who were undergone Kshara sutra ligation of haemorrhoids were selected from the from the IPD of Post Graduate of Department Shalya Tantra, Jammu Institute Of Ayurveda And Research Hospital, Nardani, Jammu. Selected patients were randomly divided into two groups each of 15 patients. For pain relief, the patients in Group A were administered with Diclofenac sodium, which is an established NSAID, in the dose of 50mg TDS orally where as the patients in Group B were administered with Triphala Guggulu and Gandhaka Rasayana in the dose of 450 mg TDS and 250 mg TDS orally respectively. Although satisfactory result obtained on all parameters with Triphala Guggulu and Gandhaka Rasayana but Diclofenac sodium is found statistically more significant.

Rajan, S. S. and S. Antony (2008). "Hypoglycemic effect of triphala on selected non insulin dependent Diabetes mellitus subjects." Ancient science of life **27**(3): 45.

Modern life style is characterized by high stress, increased automation, junk food consumption and sedentary life style which have lead to the incidence of Diabetes. The study involved selection of NIDDM subjects who were supplemented with Triphala powder called, The Three Myrobalans (Terminalia bellirica-Belliric myrobalan, Terminalia chebula-Inknut, Embilica officinalis - Indian gooseberry) for a period of 45 days. Statistical evaluation of the blood profile showed significant reduction in the blood glucose level of the subjects.

Rajarajan, S. and M. Selvi Rao (2004). "Estimation of the antibacterial activity in the seitz filtered aqueous extracts from the ripe fruit, unripe fruit and leaf galls of Terminalia chebula (chebulic myrobalan)." Biomedicine **24**(3-4): 7-11.

Triphala, a popular therapeutic preparation of Ayurvethic and Siddha systems has dried fruits of chebulic myrabalan as one of its ingredients. Besides, the ripe fruit, unripe fruits and leaf galls (marad) are also used in medicinal preparations. The study was aimed at estimation of bactericidal/ bacteriostatic activity in the seitz filtered aqueous extract of the three parts of the plant for 10 clinically relevent bacteria, namely Staphylococcus aureus ATCC 25923, Staphylococcus aureus, , Streptococcus pyogenes Escherichia coli ATCC 25922, Escherichia coli, Salmonella typhi, Salmonella para typhiA, Salmonella para typhi B, Shigella dysentriae, Vibrio cholerae. The seitz filtered extract of dried ripe fruit, fresh unripe fruits and dried leaf galls were subjected to current methods of in vitro evaluation viz., serial tube two fold macro dilution and disc diffusion methods. Inhibitory effect of each extracts was compared with standard antibiotics,

Novobiocin and Amoxycillin. The ripe fruit extract had bactericidal activity for all the ten test bacteria at 24 mg / ml concentration and unripe fruit extract had bactericidal activity at 13.5 mg / ml, while the leaf gall extract did show neither bactericidal nor bacteriostatic activity. The unripe fruit extract seem to be superior in its bactericidal activity over ripe fruit extract.

Ramalingam, K. and B. T. Amaechi (2018). "Antimicrobial effect of herbal extract of Acacia arabica with triphala on the biofilm forming cariogenic microorganisms." Journal of Ayurveda and Integrative Medicine.

Background: Dental caries is a biofilm-related infectious disease with a multifactorial etiology, over five billion inhabitants have affected worldwide due to this disease. Objective: Antimicrobial efficacy of a mixed herbal powder extract (MHPE) against cariogenic microorganisms was investigated. Materials and methods: MIC, MBC, kinetics of killing, biofilm disruption and anticaries effect of MHPE were determined. For biofilm disruption, biofilms of Streptococcus mutans, Lactobacillus casei, Actinomyces viscosus and Candida albicans were treated with MHPE for 30 min and attached cells were quantified after staining. For live/dead staining biofilm assay, S. mutans biofilm treated with MHPE for 1min, 5min and 1 h was examined with confocal laser scanning system after live/dead staining. Efficacy was experimented by structural quality using Scanning Electron Microscope (SEM). Anticaries effect was determined by formation of caries-like lesion in continuous flow biofilm model. Results: MHPE exhibited inhibition zones ranging from 12.5 to 24.0 mm. The highest inhibition zone was recorded at concentration of 50 µg/ml. MIC for S. mutans was between 12.23 and 36.7 µg/ml, while the MBC values ranged from 36.7 to 110.65 µg/ml. Inhibitory concentration of MHPE was three fold higher than CHLX. Significant reduction of cell count (49–95%) was observed with increasing time and higher concentration. Percentage biofilm reduction compare with negative control was 96.9% (A. viscosus), 94% (C. albicans), 99.8% (L. casei) and 91.7% (S. mutans). For MHPE-treated biofilm, live/dead staining demonstrated significant ($p < 0.05$) higher in deceased red fluorescence areas in all kinetics points from 53.6% (1min) to 85% (1h). SEM confirmed the damage in the outer layers of S. mutans. MHPE has components with effective antibacterial activity against caries-inducing microorganisms. Conclusion: The anti-adherence and anti-biofilm effect as well as the faster killing activity suggests that MHPE formula has effective antibacterial activity and could be a useful source of anti-cariogenic agents in near future.

Ramamurthy, J. and N. D. Jayakumar (2019). "Ocimum sanctum and its effect on oral health A comprehensive review." Drug Invention Today **11**(4): 819-821.

Drug resistance to currently used chemotherapeutics is the major factor that necessitates the search for alternative safe, efficacious and cost effective treatment options. Medicinal plants can be of good natural source which can act as anti-microbial agents. Plant extracts are used for treating various ailments as they possess anti-inflammatory, anti-bacterial, anti-fungal and antiviral effects. Phytomedicine which is nothing but use of medicinal herbs for treatment has been used for oral diseases like dental caries, periodontal diseases has ancient history. Medicinal records from India, Egypt, Greece and China has mentioned the usage of herbs like Tulsi, Neem, Curcumin, Triphala etc for treatment of oral diseases. This article highlights the use of Ocimum sanctum (Tulsi) for the treatment of Oral diseases.

Ramya Devi, D., G. Rajalakshmi, S. N. Kanchalochanaa, J. Joseph and B. N. Vedha Hari (2013). "Development of colon targeted poly-herbal tablets using tamarind seed polysaccharide." International Journal of Pharmaceutical Research **5**(2): 57-62.

Triphala churna contains Haritaki, Bibhitaki and Amalaki in combination of 1 part each. It is indicated for its astringent, laxative and anti-bacterial activity, administered at doses of 1-3 gm with hot water or honey. The present work involves the formulation of Triphala churna as tablets by wet granulation method, to increase the stability as single unit dosage form and to mask the bitter taste of the powder. Tamarind seed polysaccharide (TSP) isolated from the kernel of tamarind seeds is used as the binder for the tablet formulation since it is degraded by the enzymes present in the colon region, so that the drug release is more in the lower part of the intestine, which is the site for increased absorption and its pharmacological action. The formulation is optimized by changing the concentration of TSP binder as the variable. The powder and granules are evaluated for pre-formulation parameters and optimized for tablet compression with required hardness. The addition of TSP in tablets show good disintegration in alkaline media with enzymes and ensure complete release of the drug. The microbial load and XRF studies performed for the optimized batch of tablets prove the formulation's sterility, stability and standard limits of metal ions concentration.

Rani, P. (2014). "A clinical study to evaluate the role of holistic Ayurveda treatment in Pramehaja Timira wsr background diabetic retinopathy." Asian Resonance **3**(3): 100-107.

Diabetic Retinopathy (DR) is a long term complication of Diabetes mellitus. DR is covered under Prameja Timira in Ayurvedic concepts. Taking this concept into consideration an Open randomized control study was conducted with an aim to study DR and Pramehaja Timira conceptually and to evaluate the clinical efficacy of the holistic Ayurvedic approach in Background Diabetic Retinopathy/BDR. Total 30 patients of BDR were divided randomly into two groups, Group A (Treatment group) and Group B (Control group), each having 15 patients (30 eyes). In Group A, classical Virechana karma was adopted followed by Takra shirodhara (21 days), Pratimarsha nasya (30 days) and Rasayana yoga (30 days) simultaneously. Drugs included Deepana Pachana – Trikatu [4] (three-seven days), Snehpana – Triphala Ghrita [5] (three-seven days), Vashpa Sveda and Bala Taila Abhyanga - three days, Virechana- Virechana Yoga containing Triphala+ Trivrita+ Katuki (two:one:one). Rasayana Yoga contained equal amount of Amalaki (Emblica officinalis), Musta, Haridra and Guduchi (Tinospora cordifolia), Orally five grams twice, two hours before meal with Madhu and Ghrita for 30 days. In Group B, all the patients were kept under observation for period of 60 days. All patients in both groups continued anti hyperglycemic treatment as prescribed by their physician as well as anti- hypertensive treatment (those suffering from it). The results were drawn after analyzing statistically by paired and unpaired t tests. In Group A, out of 30 eyes, 15 (50.00%) eyes showed mild improvement, 14 (46.67%) eyes showed moderate improvement and one eye (03.33%) was unaffected. No eye showed marked improvement or progression after treatment. In Group B, out of 30 eyes, 25(83.33%) eyes showed mild improvement, three (10%) eyes showed moderate improvement, two (6.67%) eyes showed progression of the disease. No eye got marked improvement. Holistic Ayurvedic treatment was more helpful in relieving signs and symptoms of BDR patients as well as better control of FBS, PPBS and HbA1C.

Rasool, M. and E. P. Sabina (2007). "Antiinflammatory effect of the Indian ayurvedic herbal formulation Triphala on adjuvant-induced arthritis in mice." Phytotherapy Research **21**(9): 889-894.

In the present study, attempts have been made to evaluate the antiarthritic effect of the Indian Ayurvedic herbal formulation Triphala on adjuvant-induced arthritis in mice and to compare it with that of the non-steroidal antiinflammatory drug indomethacin. Arthritis was induced by intradermal injection of complete Freund's adjuvant (0.1 mL) into the right hind paw of Swiss albino mice. Triphala (1 g/kg/b.wt) and indomethacin (3 mg/kg/b.wt) were administered orally for 8 days (from day 11 to 18) after adjuvant injection. The levels of lysosomal enzymes, tissue marker enzymes, glycoproteins and paw thickness were increased in adjuvant-induced arthritic animals. The body weight was found to be reduced when compared with the control animals. These physical and biochemical changes observed in arthritic animals were altered significantly to near normal conditions after oral administration of Triphala (1 g/kg/b.wt). The results obtained clearly indicate the fact that the Indian Ayurvedic herbal formulation Triphala has promising antiinflammatory activity.

Rastogi, S., M. M. Pandey and A. K. S. Rawat (2018). "Phytochemical analysis, phenolic content and antioxidant properties of different parts of Terminalia bellirica (Gaertn.) Roxb.- A comparative study." Indian Journal of Traditional Knowledge **17**(2): 370-375.

Terminalia bellirica (Gaertn.) Roxb., commonly known as Baheda, is one of the three ingredients of the well known Ayurvedic formulation Triphala which is very effective in gastrointestinal tract and eye and brain related problems. In the present study the fruits (TBF), leaves (TBL) and bark (TBB) of T. bellirica were analyzed and phytochemical analysis for triterpenoids and phenolics was done by HPTLC. The Total phenolic content and Total flavonoid content of the samples were in the order TBL>TBF>TBB with TBL showing the highest TPC and TFC with 15.8 mg GAE/g and 33.3 mg QE/g, respectively. Ellagic acid was the most predominant constituent and was found to be present in all the samples of T. bellirica, its percentage being maximum in case of leaves (4.863 %). Their antioxidant potential was also determined. It was observed that the leaves of T. bellirica, which are rich in phenolics and flavonoids, also exhibit the highest antioxidant potential as evidenced by the better DPPH radical scavenging ability as well as the total antioxidant capacity.

Rathore, H. S., A. Mujahid, Sharad and R. Prasad (2013). "Antigenotoxic potential of trifla against potassium dichromate." International Journal of Pharmacy and Technology **5**(1): 5212-5218.

Aim of this study is to know antigenotoxic potential of Trifla (Triphala), an ancient Indian herbal formulation consisting of powdered dry fruit of Terminalia chebula, Terminalia bellerica and Embelica officinalis as 1:1:1 wt/ wt, against potassium dichromate in Tilapia mossambica fish model. Twenty fish in

each group were exposed to tap water alone (Gr I)or containing Trifla in it at 100ppm (Gr II) or potassium dichromate in it at 10 ppm (Gr III) or containing both i.e. Trifla plus potassium dichromate at 100ppm and 10 ppm respectively. Fish of group V were initially exposed to Trifla for fifteen days at 100ppm and then exposed to potassium dichromate for next 15days. Fish of group V were sacrificed on thirty first day while fish of remaining groups were sacrificed on sixteenth day. Behavior of fish was recorded and gill blood smear were made for micronuclei test. Fish remained unaffected in tap water alone and with trifla but potassium dichromate altered their behavior and induced micronuclei formation in their red blood cells. Fish exposed to both trifla & potassium dichromates are found protected but fish pretreated with trifla are not protected. This observation suggested that toxicity of potassium dichromate is declined in the presence of trifla means some interaction might have taken place between in them. To confirm this possibility laser raman spectra of tap water containing trifla alone, potassium dichromate alone and their mixture were analyzed. Altered spectrum of mixture (trifla plus potassium dichromate) indicates that trifla has probably reduced potassium dichromate in the medium. Findings suggested that trifla can be tested for use in phytoremediation of environment toxicants which act via oxidative stress.

Rayudu, V. and A. Raju (2014). "Effect of Triphala on dextran sulphate sodium-induced colitis in rats." AYU (An international quarterly journal of research in Ayurveda) **35**(3): 333-338.

Background: Herbal products from Ayurveda were always in the forefront in providing leads to new drug discovery. Triphala, an ancient Ayurvedic herbal formulation comprises of equal portions of Amalaki, Bibhitaki and Haritaki and is used extensively for constipation, as an anti-inflammatory, analgesic, anti-arthritic, hypoglycemic and an anti-aging agent. Aim: To evaluate the effect of Triphala on dextran sulphate sodium induced colitis in rats. Materials and Methods: Present study carried out in total five groups (n = 6 in each group); first group served as normal, second group control, third group standard control and remaining two as test drug groups. Mesalzine was used as a standard drug for comparison. Two doses (150 mg/kg and 300 mg/kg) of Triphala were given as treatment for two separate groups of colitis rats for 7 days. C-reactive protein, superoxide dismutase, catalase, malondialdehyde levels were evaluated and histological study of the distal colon was conducted. Results: The colitis rats treated with higher dose of Triphala (300 mg/kg) exhibited normal parameters similar to normal control group animals, which is on par with standard drug mesalzine effect. Conclusion: The results suggest that Triphala (300 mg/kg) has a considerable and reliable effect in reducing colitis in rats. This effect can be attributed to its antioxidant activity and well presence of flavonoids.

Reddy, T. C., P. Aparoy, N. K. Babu, K. A. Kumar, S. K. Kalangi and P. Reddanna (2010). "Kinetics and docking studies of a COX-2 inhibitor isolated from terminalia bellerica fruits." Protein and Peptide Letters **17**(10): 1251-1257.

Triphala is an Ayurvedic herbal formulation consisting of equal parts of three myrobalans: Terminalia chebula, Terminalia bellerica and Emblica officinalis. We recently reported that chebulagic acid (CA) isolated from Terminalia chebula is a potent COX-2/5-LOX dual inhibitor. In this study, compounds isolated from Terminalia bellerica were tested for inhibition against COX and 5-LOX. One of the fractionated compounds showed potent inhibition against COX enzymes with no inhibition against 5-LOX. It was identified as gallic acid (GA) by LC-MS, NMR and IR analyses. We report here the inhibitory effects of GA, with an IC50 value of 74 nM against COX-2 and 1500 nM for COX-1, showing ~20 fold preference towards COX-2. Further docking studies revealed that GA binds in the active site of COX-2 at the nonsteroidal anti-inflammatory drug (NSAID) binding site. The carboxylate moiety of GA interacts with Arg120 and Glu524. Based on substrate dependent kinetics, GA was found to be a competitive inhibitor of both COX-1 and COX-2, with more affinity towards COX-2. Taken together, our studies indicate that GA is a selective inhibitor of COX-2. Being a small natural product with selective and reversible inhibition of COX-2, GA would form a lead molecule for developing potent anti-inflammatory drug candidates.

Renuka, S. and N. P. Muralidharan (2017). "Comparison in benefits of herbal mouthwashes with chlorhexidine mouthwash: A review." Asian Journal of Pharmaceutical and Clinical Research **10**(2): 3-7.

Objective: To discuss the benefits of herbal mouthwashes with the standard chlorhexidine mouthwash. This review is conducted to explore the benefits of herbal mouthwashes. Methods: Many herbal extracts are now available as mouthwash for maintaining the good oral hygiene. Plaque accumulation and increase in oral microorganisms are the main factors for poor oral hygiene. Herbal extracts such as German chamomile, Terminalia chebula, Aloe vera, Green tea, peppermint satva, turmeric, neem, triphala, pomegranate extracts, guava extract, propolis, alum, darim leaves, mulethi, etc., are similar to chlorhexidine in plaque control and gingivitis reduction. Many herbal mouthwashes contain herbs with anti-microbial property such as neem, yavani satva, nagavalli, Gandhapura taila, pilu, Bibhitaka, Ocimum,

Echinacea, Chameli leaves, etc. Many herbs are with anti-inflammatory and anti-oxidant property such as neem, clove, triphala (combination of amalaki, haritaki, and vibhitaki), tulsi, grapefruit, celery, licorice, katha, spearmint, and chamomile essential oil. Some herbal mouthwash with chamomile extract kills some skin pathogens such as staphylococcus and Candida species. Mixture of Staphysagria, Chamomilla, Echinacea, Plantago, Ocimum, and Cistus extracts used as mouth wash which was is better than chlorhexidine in reducing salivary mutans streptococci count. Hence usage of herbal mouthwash will enhance the oral hygiene comparatively with chlorhexidine mouthwash without any adverse effects. Result: Though herbal mouthwashes has the ability to maintain good oral hygiene on daily basis, but still it is less effective than chlorhexidine mouthwash during treatments like gingivitis, periodontitis, trauma, etc. Conclusion: Besides the disadvantages, chlorhexidine mouthwash plays effective role during dental treatments on short term usage. Herbal mouthwashes are suitable for maintaining good oral prophylaxis. Many programs have to be conducted to make them aware about mouthwashes in their oral hygiene.

Rezvani, M. S., E. Bakhtiari, Z. Tayarani-Najaran and S. H. Mousavi (2018). "Synergistic and defensive properties of Emblica officinalis, Terminalia chebula, and Terminalia bellerica extracts against serum/glucose deprivation-induced PC12 cells death." Jundishapur Journal of Natural Pharmaceutical Products **13**(1).

Background: Triphala as a combination of three plant's fruits including Emblica officinalis Gaertn, Terminalia chebula Retz, and Terminalia bellerica Roxb is valued for its antioxidant properties. It has been routinely used in various medicinal studies. Objective: In this study, the protective effects of E. officinalis, T. chebula, T. bellerica, and Triphala methanolic extracts on cell viability and reactive oxygen species (ROS) generated in PC12 cells were studied under serum/glucose deprivation (SGD) induced cell injury. Synergistic activity of three extracts was also explored. Methods: Cells were seeded overnight and then exposed to SGD condition for 18 h. Next, they were pretreated with different concentrations of the four extracts (3 -250 µg/ml) for 4 h. Cell viability and ROS generation were evaluated by viability assay and flow cytometry, respectively. Synergistic activity of three extracts was analyzed with Compusyn software. Results: SGD could induce cell toxicity after 18 h ($P < 0.001$). Pretreatment with extracts reduced SGD toxicity in PC12 cells. A significant raise in ROS generation was seen following SGD-induced toxicity. Pretreatment with T. chebula reversed the increased ROS production following ischemic insult. Conclusion: These results demonstrated the neuroprotection of these extracts possibly by ROS decrement and synergistic activity of them against SGD-induced toxicity.

Russell Jr, L. H., E. Mazzio, R. B. Badisa, Z. P. Zhu, M. Agharahimi, D. J. Millington and C. B. Goodman (2011). "Differential cytotoxicity of triphala and its phenolic constituent gallic acid on human prostate cancer LNCap and normal cells." Anticancer Research **31**(11): 3739-3745.

Background: Prostate cancer is one of the most commonly diagnosed solid malignancies among US men. We identified gallic acid (GA) as a major bioactive cytotoxic constituent of a poly herbal Ayurvedic formulation - triphala (TPL). Both TPL and GA were evaluated on (AR) + LNCaP prostate cancer and normal epithelial cells. Materials and Methods: Total polyphenols in TPL were determined using Folin and Ciocalteu method, followed by GA quantitation by high performance liquid chromatography. Cell toxicity was evaluated by crystal violet after 24, 48, 72 and 96 h. Results: TPL contains 40% unidentified polyphenolic acids, of which 2.4% comprised GA. GA induced severe morphological alterations and was about 3-fold more cytotoxic towards cancer cells than TPL. This activity increased further in the presence of dihydrotestosterone. GA toxicity on normal cells was low at 72 h. Combination of GA with flutamide caused higher toxicity to cancer cells than either of the compounds alone. Conclusion: GA appears to have promising anticancer activity.

Sabina, E. P. and M. Rasool (2008). "An in vivo and in vitro potential of Indian ayurvedic herbal formulation Triphala on experimental gouty arthritis in mice." Vascular Pharmacology **48**(1): 14-20.

In the present study, we have investigated the efficacy of Indian ayurvedic herbal formulation Triphala on monosodium urate crystal-induced inflammation in mice; an experimental model for gouty arthritis and compared it with that of the non-steroidal anti-inflammatory drug, Indomethacin. The anti-arthritic effect of Triphala was evaluated by measuring changes in the paw volume, lysosomal enzyme activities, lipid peroxidation, anti-oxidant status and inflammatory mediator TNF-α in control and monosodium urate crystal-induced mice. The levels of β-glucuronidase and lactate dehydrogenase were also measured in monosodium urate crystal-incubated polymorphonuclear leucocytes (PMNL). Triphala treatment (1 gm/kg/b.w. orally) significantly inhibited the paw volume and the levels of lysosomal enzymes, lipid peroxidation and inflammatory mediator tumour necrosis factor-α; however the anti-oxidant status was found to be increased in plasma, liver and spleen of monosodium urate crystal-induced mice when

compared to control mice. In addition, β-glucuronidase and lactate dehydrogenase level were reduced in Triphala (100 µg/ml) treated monosodium urate crystal-incubated polymorphonuclear leucocytes. In conclusion, the results obtained clearly indicated that Triphala exerted a strong anti-inflammatory effect against gouty arthritis.

Sabina, E. P., M. Rasool, M. Vedi and A. Geethanjali (2013). "Protective properties of traditional herbal formulation triphala against D-Galactosamine induced hepatotoxicity in mice." International Journal of Drug Development and Research **5**(2): 164-173.

The aim of the present study was to investigate the hepatoprotective effects of Triphala in D-Galactosamine (D-GalN) induced hepatic toxicity in mice. The mice received a single dose of galactosamine (700mg/kg, i.p) to induce hepatotoxicity; Triphala extract (1000mg/kg, i.p) and silymarin (25 mg/kg, i.p.) were administered after the injection of galactosamine. Aspartate transaminase (AST), alanine transaminase (ALT), alkaline phosphatase (ALP), Tumour necrosis factoralpha (TNF α) bilirubin, lipid peroxidation (LPO), superoxide dismutase (SOD), catalase (CAT), glutathione peroxidise (GPx), glutathione reductase (GR), glutathione-s-transferase (GST) and total reduced glutathione were estimated in serum of the mice.It was found that D-GalN induced hepatic damage resulted in a significant ($p<0.05$) increase in the activity of ALT, AST, ALP, bilirubin, LPO and TNF- αlevel with a decrease in the levels of anti-oxidant enzymes such as SOD, CAT, GPx, GR, GST and Total reduced glutathione which attained normal levels after the treatment of Triphala extract (1000mg/kg/b.wt, i.p). These biochemical observations were supported by histopathological examination of mice liver sections. These observations demonstrate that Triphala treatment may attenuate protective activity against D-galactosamine-induced hepatotoxicity in mice.

Sabina, E. P., M. K. Rasool and L. Mathew (2009). "In vivo and in vitro immunomodulatory effects of Indian ayurvedic herbal formulation triphala on experimental induced inflammation." Pharmacologyonline **2**: 840-849.

In the present study, an attempt has been made to evaluate the immunomodulatory effects of the Indian ayurvedic herbal formulation Triphala on experimental induced inflammation. The effect of Triphala was investigated on complement activity, humoral immune response, and cell mediated immune response in mice, and in mitogen (phytoheamagglutinin)-induced T-lymphocyte proliferation in vitro. Triphala administration significantly inhibited the complement activity, humoral and cell mediated immune response (delayed type hypersensitivity reaction (DTH)), and mitogen (phytohaemagglutinin)-induced T-lymphocyte proliferation in a dose dependent manner. These observations suggest that Triphala caused immunosuppression in experimental-induced inflammation, indicating that they may provide an alternative approach to the treatment of inflammatory and autoimmune diseases.

Sabu, M. C. and R. Kuttan (2002). "Anti-diabetic activity of medicinal plants and its relationship with their antioxidant property." Journal of Ethnopharmacology **81**(2): 155-160.

Methanolic extract (75%) of Terminalia chebula, Terminalia belerica, Emblica officinalis and their combination named 'Triphala' (equal proportion of above three plant extracts) are being used extensively in Indian system of medicine. They were found to inhibit lipid peroxide formation and to scavenge hydroxyl and superoxide radicals in vitro. The concentration of plant extracts that inhibited 50% of lipid peroxidation induced with Fe2+/ascorbate were food to be 85.5, 27, 74 and 69 µg/ml, respectively. The concentration needed for the inhibition of hydoxyl radical scavenging were 165, 71, 155.5 and 151 µg/ml, and that for superoxide scavenging activity were found to be 20.5, 40.5, 6.5 and 12.5 µg/ml, respectively. Oral administration of the extracts (100 mg/kg body weight) reduced the blood sugar level in normal and in alloxan (120 mg/kg) diabetic rats significantly within 4 h. Continued, daily administration of the drug produced a sustained effect.

Safiaghdam, H., V. Oveissi, R. Bahramsoltani, M. H. Farzaei and R. Rahimi (2018). "Medicinal plants for gingivitis: A review of clinical trials." Iranian Journal of Basic Medical Sciences **21**(10): 978-991.

Objective(s): Periodontal diseases are among prevalent oral health problems which may ultimately lead to severe complications in oral cavity. Herbal products can be designed as single or multicomponent preparations for better oral health. This study aims to review current clinical trials on the effectiveness of herbal products in gingivitis. Materials and Methods: Electronic databases, including Pub Med, Scopus, Science Direct and Cochrane library were searched with the keywords “gingivitis” in the title/abstract and “plant/ extract/ herb” in the whole text for clinical trials on herbal treatments for gingivitis. Data were collected from 2000 until January 2018. Only papers with English full-texts were included in our study. Results: Herbal medicines in the form of dentifrice, mouth rinse, gel, and gum were assessed in gingivitis via specific indices including plaque index, bleeding index, microbial count, and biomarkers of

inflammation. Pomegranate, aloe, green tea, and miswak have a large body of evidence supporting their effectiveness in gingivitis. They could act via several mechanisms such as decrease in gingival inflammation and bleeding, inhibition of dental plaque formation, and improvement in different indices of oral hygiene. Some polyherbal formulations such as triphala were also significantly effective in managing gingivitis complications. Conclusion: Our study supports the efficacy and safety of several medicinal plants for gingivitis; however, some plants do not have enough evidence due to the few number of clinical trials. Thus, future studies are mandatory for further confirmation of the efficacy of these medicinal plants.

Saharan, B. S. and Lovely (2007). "Studies on antibacterial activity of selected Ayurvedic medicines towards soil bacteria." Annals of Agri Bio Research **12**(1): 35-40.

In the present study, Ayurvedic preparations used for gastric problems were subjected to detailed scientific investigations for their antimicrobial activity against various pathogenic microorganisms. Different isolates have shown varying degree of inhibitory efficacy. Twenty bacterial strains (A1 to A20) were isolated from the soil samples. Some Ayurvedic medicines (Pudin hara, Amrit dhara, Shankhbati and Triphala) were used. The maximum zone of inhibition (16 mm) at 100% concentration was observed in case of isolate A14. Isolates A4, A14, A15, A16 and A18 showed sensitivity even at 25% (v/v of Pudin hara). The isolates A11, A12 and A13 showed minimum zone of inhibition of 4 mm at 100% of Pudin hara. In case of Amrit dhara, the maximum zone of inhibition of 27 mm at 100% concentration was observed in case of isolate A20. It showed the sensitivity even at 25% concentration of Amrit dhara against all isolates. The minimum zone of inhibition (13 mm; 100% concentration, v/v) was shown against isolate A11. Most of the isolates were sensitive to the effect of Shankhbati. The isolate A5 showed the maximum zone of inhibition of 35 mm at 100% concentration. It was sensitive even at 25% of Shankhbati. On the other hand, the isolate A17 showed minimum zone of inhibition of 12 mm at 100% concentration. The isolate A1 showed the maximum zone of inhibition (25 mm) at original concentration of Triphala. The isolates include Gram positive rods (A1, A2, A3, A4, A5 and A6), cocci (A7, A8, A9, A10, A14, A15, A16 and A19) and Gram negative rods (A11, A12 and A13). The isolates A7, A8, A9, A10, A11, A12, A13 and A20 showed catalase positive test. Isolates A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A14, A15 and A16 showed the liquefication of gelatin i. e. positive test. The bacterial isolates A11, A12 and A13 showed positive test for indole production. The isolates A7 to A13 and A19 showed MR positive and VP negative. The isolates, namely, A14, A15 and A16 were found citrate positive. The most of the bacteria were sensitive to the effect of Ayurvedic medicines. Amrit dhara, Shankhbati and Triphala showed good inhibitory effect on soil isolates. While Pudin hara was comparatively less effective against the isolates.

Salutgi, S. B., B. S. Phadnaik, R. D. Sadekar and A. G. Bhandarkar (1996). "Effect of the indigenous drug 'lipidsol' on certain metabolic parameters in goats." Indian Veterinary Journal **73**(10): 1035-1038.

'Lipidsol'* is an indigenous plant preparation containing ginger, guggul, triphala, pipli, kalipat, balmool, phanchmool, shatavari and lohabhasma. These ingredients have been attributed to have hypolipidemic properties in ayurvedic literature. The present investigation reports on the effects of Lipidsol on certain blood biochemical constituents in goats, in which hyperlipidemia was initially produced by administering oral cotton seed oil.

Sandhya, T., K. M. Lathika, B. N. Pandey, H. N. Bhilwade, R. C. Chaubey, K. I. Priyadarsini and K. P. Mishra (2006). "Protection against radiation oxidative damage in mice by Triphala." Mutation Research - Genetic Toxicology and Environmental Mutagenesis **609**(1): 17-25.

Protection against whole body γ-irradiation (WBI) of Swiss mice orally fed with Triphala (TPL), an Ayurvedic formulation, in terms of mortality of irradiated animals as well as DNA damage at cellular level has been investigated. It was found that radiation induced mortality was reduced by 60% in mice fed with TPL (1 g/kg body weight/day) orally for 7 days prior to WBI at 7.5 Gy followed by post-irradiation feeding for 7 days. An increase in xanthine oxidoreductase activity and decrease in superoxide dismutase activity was observed in the intestine of mice exposed to WBI, which, however, reverted back to those levels of sham-irradiated controls, when animals were fed with TPL for 7 days prior to irradiation. These data have suggested the prevention of oxidative damage caused by whole body radiation exposure after feeding of animals with TPL. To further understand the mechanisms involved, the magnitude of DNA damage was studied by single cell gel electrophoresis (SCGE) in blood leukocytes and splenocytes obtained from either control animals or those fed with TPL for 7 days followed by irradiation. Compared to irradiated animals without administering TPL, the mean tail length was reduced about three-fold in blood leukocytes of animals fed with TPL prior to irradiation. Although, similar protection was observed in splenocytes of TPL fed animals, the magnitude of prevention of DNA damage was significantly higher than that observed in

leukocytes. It has been concluded that TPL protected whole body irradiated mice and TPL induced protection was mediated through inhibition of oxidative damage in cells and organs. TPL seems to have potential to develop into a novel herbal radio-protector for practical applications

Sandhya, T., K. M. Lathika, B. N. Pandey and K. P. Mishra (2006). "Potential of traditional ayurvedic formulation, Triphala, as a novel anticancer drug." Cancer Letters **231**(2): 206-214.

The cytotoxic effects of aqueous extract of Triphala, an ayurvedic formulation, were investigated on human breast cancer cell line (MCF-7) and a transplantable mouse thymic lymphoma (barcl-95). The viability of treated cells was found to decrease with the increasing concentrations of Triphala. On the other hand, treatment of normal breast epithelial cells, MCF-10 F, human peripheral blood mononuclear cells, mouse liver and spleen cells, with similar concentrations of Triphala did not affect their cytotoxicity significantly. The drug treatment was found to induce apoptosis in MCF-7 and barcl-95 cells in vitro as determined by annexin-V fluorescence and proportion of apoptotic cells was found dependent on Triphala concentration. MCF-7 cells treated with Triphala when subjected to single cell gel electrophoresis, revealed a pattern of DNA damage, characteristic of apoptosis. Studies on Triphala treated MCF-7 and barcl-95 cells showed significant increase in intracellular reactive oxygen species (ROS) in a concentration dependent manner. ROS increase was, however, found to be insignificant in MCF-10 F as well as in murine spleen and liver normal cells. In vivo, direct oral feeding of Triphala to mice (40 mg/kg body weight) transplanted with barcl-95 produced significant reduction in tumor growth as evaluated by tumor volume measurement. It was also found that apoptosis was significantly higher in the excised tumor tissue of Triphala fed mice as compared to the control, suggesting the involvement of apoptosis in tumor growth reduction. These results suggest that Triphala possessed ability to induce cytotoxicity in tumor cells but spared the normal cells. The differential effect of Triphala on normal and tumor cells seems to be related to its ability to evoke differential response in intracellular ROS generation. The differential response of normal and tumor cells to Triphala in vitro and the substantial regression of transplanted tumor in mice fed with Triphala points to its potential use as an anticancer drug for clinical treatment.

Sandhya, T. and K. P. Mishra (2006). "Cytotoxic response of breast cancer cell lines, MCF 7 and T 47 D to triphala and its modification by antioxidants." Cancer Letters **238**(2): 304-313.

The cytotoxic effects of Triphala (TPL), an Indian Ayurvedic formulation with known anti-cancer properties, has been investigated on two human breast cancer cell lines differing in their p53 status. In vitro studies showed that MCF 7 with wild type p53 was more sensitive to TPL than T 47 D, which is p53 negative. TPL induced loss of cell viability was determined by MTT assay. After 72 h incubation, the IC 50 values for MCF 7 was found to be ~8 μg/ml and that for T 47 D was ~26 μg/ml. Moreover, TPL inhibited the clonogenic growth of MCF 7 cells, which was significantly recovered by pifithrin-α, the p53 inhibitor. However, pifithrin-α, did not modify TPL induced cytotoxicity in T 47 D cells. Exogenous addition of antioxidants, glutathione (GSH) and N-Acetyl-Cysteine (NAC) inhibited the anti-proliferative ability of TPL in both MCF 7 and T47 D. Annexin-V and propidium iodide double staining of cells treated with TPL for 2 h revealed that TPL induced significant apoptosis in both the cell lines in a dose dependant manner but magnitude of apoptosis was significantly higher in MCF 7 than in T 47-D cells. TPL was also found to induce dose and time dependent increase in intracellular reactive oxygen species in both the cell lines. Present results have demonstrated that MCF 7 and T 47 D cells exhibited differential sensitivity to TPL, which seems to be dependant on their p53 status. Inhibition of anti-proliferative ability of TPL by antioxidants suggests a role for TPL induced ROS in the induction of apoptosis. It is concluded that p53 status of cancer cells formed an important factor in predicting the response of cancer cells to prooxidant drugs.

Sangle, V. D., S. D. Nadkarni, M. K. Vahalia and M. S. Darp (2004). "The study of effect of ayurvedic processing of commiphora wightii on gastric irritancy index in experimental animals." Indian Drugs **41**(5): 268-271.

Different Shodhandravyas are used for Shodhanvidhi of Guggulu. We have evaluated the effect of guggulu (which was processed by different methods of Shodhanvidhi) on gastric mucosa in wistar rats. Guggul was administered orally in therapeutic doses to different groups of wistar rats. The animals were sacrificed and Gastric Irritancy Index (GII) was calculated. It was observed that the GII of Gulvel kwath shodhit guggulu & Gomutra shodhit guggulu was comparable to GII calculated in control group of animals. Gastric Irritancy Index of Dashmool kadha shodhit guggulu & Triphala kadha shodhit guggulu was significantly high ($p < 0.01$) than GII of control group of animals. An allopathic medicine - Sodium Diclofenac, known to cause gastric mucosal damage was considered for comparison. Gastric Irritancy Index of animals treated with Ashuddha guggulu was significantly higher ($p < 0.001$) than control groups of animals. We have also evaluated some of our marketed preparation of guggulu tablets namely Amrutadi guggulu, Mahayograj

guggulu, Panchatikta guggulu & Kanchanar guggulu for their potential to cause gastric irritation in experimental animals. The GII of Panchatikta guggulu tablets was found to be the least (6.33 ± 2.66) and was comparable to GII (8.67 ± 3.12) of control group of animals.

Saraphanchotiwitthaya, A. and P. Sripalakit (2015). "Immunomodulatory effect of different proportions of the herbal mixture in triphala on human t lymphocytes (molt-4)." International Journal of Pharmacy and Pharmaceutical Sciences **7**(7): 282-288.

Objectives: To investigate effect of different proportions of Terminalia bellerica Roxb (TB):Terminalia chebula Retz (TC):Phyllanthus emblica L. (PE) in triphala extract on immunological activity and to determine the possibility of applying the appropriate extract for health and immune disorders. Methods: The extracts with different proportions of TB: TC: PE (w/w/w), i.e.12:8:4 (F1), 4:12:8 (F2), 8:4:12 (F3) and 8:8:8 (F4), were prepared by decoction in water and dried under vacuum. Gallic acid, a major compound in triphala, was detected by high performance liquid chromatography (HPLC). The effect of the extracts on IFN-g and IL-10 cytokine production produced by MOLT-4 cells was determined by ELISA. Results: The results show that F1, F4 and TB extracts significantly stimulated IFN-g production but no alteration in IL-10 expression was observed. With LPS induction, F1, F2, F3 and PE extracts significantly inhibited IFN-g production, while F2, F3, TB and TC extracts inhibited IL-10 production. By determining the IFN-g/IL-10 cytokine ratio, we found that the Th1/Th2 balance after treatment with triphala extract was mainly skewed toward a Th1-like response. With LPS induction, only the F1 extract could restore the balance of immunity by shifting the Th2 response to a normal level. Conclusion: Our investigation indicates that different proportions of triphala extracts and induction conditions affect cytokine production, with a predominant Th1 response. F4, the equal proportion triphala extract, could be applied as a healthy herbal drink. F1, containing a high proportion of T. bellerica, was a promising extract as an effective therapeutic intervention against Th2 imbalance diseases such as allergy and autoimmune disease or for use with cancer vaccines.

Saravanan, S., R. Srikumar, S. Manikandan, N. Jeya Parthasarathy and R. Sheela Devi (2007). "Hypolipidemic effect of triphala in experimentally induced hypercholesteremic rats." Yakugaku Zasshi **127**(2): 385-388.

Hypercholesteremia is one of the risk factors for coronary artery disease. The present study highlights the efficacy of Ayurvedic herbal formulation Triphala (Terminalia chebula, Terminalia belerica, and Emblica officinalis) on total cholesterol, Low density lipoprotein (LDL), Very low density lipoprotein (VLDL), High density lipoprotein (HDL) and free fatty acid in experimentally induced hypercholesteremic rats. Four groups of rats were employed namely control, Triphala treated, hypercholesterolemia rats (4% Cholesterol+1% cholic acid+egg yolk) and Triphala pre-treatment in hypercholesteremic rats. Results showed significant increase in the total cholesterol, LDL, VLDL, and free fatty acid in hypercholesteremic rats were significantly reduced in Triphala treated hypercholesteremic rats. The data demonstrated that Triphala formulation was associated with hypolipidemic effects on the experimentally induced hypercholesteremic rats.

Sathavane, G. V., D. H. Pandya and M. S. Baghel (2015). "Effect of Vatari Guggulu in the management of Gridhrasi (sciatica)." AYU (An international quarterly journal of research in Ayurveda) **36**(1): 41-45.

Introduction: Low back pain is one of the common conditions of loco motor system disorder, affects people during their productive life. About 40% cases of low back pain are of radicular in origin and considered under the umbrella of sciatic syndrome. It is a pain dominant disease and reduces human activity considerably in terms of personal as well as social and professional life. The condition resembles disease Gridhrasi mentioned in Ayurveda under the umbrella of Vatavyadhi, and here piercing type of pain which restricts the movement of the affected leg, make his walking pattern-like bird vulture and put him in disgraceful condition. Aim: To assess the effect of Vatari Guggulu (which contains Triphala) on the management of Gridhrasi. Materials and Methods: A total of 40 patients of Gridhrasi were registered and Vatari Guggulu 3 tablet (500 mg each) twice a day was administered before meal with lukewarm water for 30 days. Results and Conclusions: About 32.35% of the patient improved moderately while mild improvement was observed in 47.09% of the patients. The drug has shown better effect on patients of Vata Kaphaja type of Gridhrasi in comparison of Vataja type of Gridhrasi.

Sato, V. H., B. Sungthong, N. Nuamnaichati, P. O. Rinthong, S. Mangmool and H. Sato (2017). "In vivo and in vitro evidence for the antihyperuricemic, anti-inflammatory and antioxidant effects of a Traditional Ayurvedic Medicine, Triphala." Natural Product Communications **12**(10): 1635-1638.

The objectives of the present study were to demonstrate the antihyperuricemic effect of triphala, a formulation of traditional Ayurvedic medicine, in potassium oxonate-induced hyperuricemic mice in vivo,

and to examine its inhibitory effects on xanthine oxidase (XOD), inflammatory mediators and DPPH radicals in vitro. The water extract of triphala was determined to contain the total phenolics and total flavonoids of 317.6 ± 9.2 mg GAE/g and 7.73 ± 0.26 mg QE/g, respectively. Oral administrations of triphala significantly reduced the plasma uric acid levels of potassium oxonate-induced hyperuricemic mice at doses of 1,000 and 1,500 mg/kg, as compared with control (p<0.05). Moreover, both doses of triphala treatments markedly inhibited the formation of uric acid due to inhibition of XOD activity in liver homogenates extracted from the hyperuricemic mice by about 70-80%. Lineweaver-Burk analysis of enzyme-kinetic data showed that triphala exhibited non-competitive inhibition on XOD activity in vitro with an inhibitory constant (Ki) of 590 μg/mL. Furthermore, triphala significantly suppressed the mRNA expressions of COX-II, TNF-α and iNOS in LPS-stimulated RAW 264.7 cells, as compared with control (p<0.05), and decreased the expression of TGF-β IC50 values for inhibition of DPPH radical formation was calculated to be 21.9 ± 2.50 μg/mL. Antioxidant activities of triphala were determined to be 0.81 ± 0.07 g TEAC/g and 6.78 ± 0.29 mmol/100g, respectively, as assessed by ABTS and FRAP assays. In conclusion, this study provided in vivo and in vitro mechanistic evidence for the antihyperuricemic, antioxidative and anti-inflammatory effects of triphala for the first time, rationalizing its therapeutic usage for the treatment of hyperuricemia of gout.

Savarikar, S. S., M. M. Barbhind, U. K. Halde and A. P. Kulkarni (2011). "Pharmaceutical and analytical evaluation of triphalaguggulkalpa tablets." Journal of Ayurveda and Integrative Medicine **2**(1): 21-25.

Aim of the Study: Development of standardized, synergistic, safe and effective traditional herbal formulations with robust scientific evidence can offer faster and more economical alternatives for the treatment of disease. The main objective was to develop a method of preparation of guggulkalpa tablets so that the tablets meet the criteria of efficacy, stability, and safety. Materials and Methods: Triphalaguggulkalpa tablet, described in sharangdharsanhita and containing guggul and triphala powder, was used as a model drug. Preliminary experiments on marketed triphalaguggulkalpa tablets exhibited delayed in vitro disintegration that indicated probable delayed in vivo disintegration. The study involved preparation of triphalaguggulkalpa tablets by Ayurvedic text methods and by wet granulation, dry granulation, and direct compression method. The tablets were evaluated for loss on drying, volatile oil content, % solubility, and steroidal content. The tablets were evaluated for performance tests like weight variation, disintegration, and hardness. Results: It was observed that triphalaguggulkalpa tablets, prepared by direct compression method, complied with the hardness and disintegration tests, whereas tablets prepared by Ayurvedic text methods failed. Conclusion: Direct compression is the best method of preparing triphala guggul kalpa tablets.

Save, S. N. and S. Choudhary (2017). "Effects of triphala and guggul aqueous extracts on inhibition of protein fibrillation and dissolution of preformed fibrils." RSC Advances **7**(33): 20460-20468.

Herbal preparations have long been used for treatment of variety of diseases. However, a systematic and scientific evaluation of their effects and mechanisms of action have been lacking, although it is believed that synergistic complementation of the effects of the multiple chemical components in these preparations would be playing crucial regulatory roles in the different metabolic pathways which may interfere in a biological system. In this context, we investigate here protein fibrillation which is known to be an important process responsible for many neurodegenerative and other diseases. Using lysozyme as a model protein, we have studied using a combination of spectroscopic and microscopic techniques, the effects of two herbal preparations, derived from triphala and guggul, on the fibrillation process. We observed that both the extracts have the ability to inhibit protein fibrillation but triphala has much more dominating influence on fibrillation inhibition. The kinetics of fibrillation has been monitored by fluorescence spectroscopy as well as absorption spectroscopy, and the morphological changes associated with fibrillation have been monitored by transmission electron microscopy. Our experiments seem to suggest an interference (or synergy), though minor, between the effects of triphala and guggul on the fibrillation/aggregation process. We also observed that both triphala and guggul have the ability to dissolve preformed fibrils and aggregates of lysozyme, in a synergistic manner. We believe, the present indication of possible synergy between triphala and guggul can be conceptually extrapolated to the components of the individual preparations. Thus, the current work has significant therapeutic implications and will provide scientific basis to the development of new generation of phytopharmaceuticals which can be used alone or in combination with other drugs.

Sawant, D. P., G. R. Parlikar and S. V. Binorkar (2013). "Efficacy of Triphala Ghrita Netratarpan in computer vision syndrome." International Journal of Research in Ayurveda and Pharmacy **4**(2): 244-248.

In present era, the computerization in a country is necessary for the progress. It seems that the work at computer is very intensive and most tiring. Computer Vision Syndrome (CVS) is the complex condition of eye and vision problems that are related to near work which are experienced during or related to computer use. Traditional medicine has been practiced for many centuries in many parts of the world. The present study was undertaken to evaluate the effect of Triphala Ghrita Tarpan herbal compound preparation as per the classics in 30 patients suffering from CVS in trial group for 7 days in three consecutive months. The duration of Tarpana was 15-20 minutes. While the control group also included with 30 patients and were advised with certain eye exercise. The results in trial group were satisfactory and Tarpana was found to be effective in treating all the signs and symptoms of CVS which was supported by the statistical analysis (P<0.001).

Saxena, D., S. G. Saha, M. K. Saha, S. Dubey and M. Khatri (2015). "An in vitro evaluation of antimicrobial activity of five herbal extracts and comparison of their activity with 2.5% sodium hypochlorite against Enterococcus faecalis." Indian Journal of Dental Research **26**(5): 524-527.

Context: Sodium hypochlorite is the most widely used irrigant in endodontic practice, but it has various disadvantages. Literature has shown that herbal products such as Propolis, Azadirachta indica (AI), Triphala, Curcuma longa, and Morinda citrifolia (MC) possess good antimicrobial properties and thus can be used as potential endodontic irrigants. Aim: To evaluate and compare the antimicrobial activity of five herbal extracts, i.e., Propolis, AI, Triphala, C. longa, and MC with that of 2.5% sodium hypochlorite against Enterococcus faecalis. Materials and Methods: E. faecalis American Type Culture Collection 21292 was inoculated onto brain heart infusion agar plate. Discs impregnated with herbal medicaments were placed on the inoculated plates and incubated at 37°C aerobically for 24 h and growth inhibition zones were measured. Statistical Analysis: Mean zone of inhibition in descending order was found as sodium hypochlorite > Propolis > AI > Triphala > C. longa = MC > ethanol. Statistical analysis was performed using one-way analysis of variance which showed a significant difference in the zone of inhibition of sodium hypochlorite and Propolis (P < 0.001). Results: Propolis showed highest zone of inhibition among all the herbal extracts next to sodium hypochlorite. Conclusion: Propolis and AI have significant antimicrobial activity against E. faecalis.

Saxena, S., N. Lakshminarayan, S. Gudli and M. Kumar (2017). "Anti bacterial efficacy of terminalia chebula, Terminalia Bellirica, Embilica officinalis and triphala on salivary Streptococcus mutans count – A linear randomized cross over trial." Journal of Clinical and Diagnostic Research **11**(2): ZC47-ZC51.

Introduction: From the oral health perspective, it is well established that microorganisms have an important role in caries aetiology. From the dawn of civilization, herbal plants have served an array of roles. Triphala a tradtional herbal Ayurvedic formula consists of three native fruits of india including Terminalia Chebula (T. chebula), Terminalia Bellirica (T. bellirica) and Embilica Officinalis (E. officinalis). As per Ayurvedic Formulary of India (AFI) Triphala is prepared by combining a 1:1:1 mixture of ground dry fruits called myrobalans. Till date, an inadequate number of clinical researches on herb based mouth rinses have been reported in Asia, especially in India and other Southeast Asian countries (where these products are most accepted and widely used). The present study was planned to assess the effectiveness of Triphala with its three constituents. Aim: The objective of this study was to determine the effect of Triphala, T. chebula, T. bellirica and E. officinalis aqueous extract rinses separately on Streptococcus mutans count at various time intervals. Materials and Methods: This is a double-blind, linear cross over, within group experimental trial conducted among subjects visiting the Department of Public Health Dentistry aged 15 to 40 years. In this design, subjects received all of the treatments sequentially in time. The independent variables to be assessed in this study were all the four interventions of herbal preparations used and the dependent variable assessed is anti bacterial efficacy. Each subject receives two or more different treatments. All the subjects were exposed to all four interventions: 1) T. chebula; 2) T. bellirica; 3) E. officinalis; and 4) Triphala and were provided 15 ml of the freshly prepared 10% rinse. The subjects were instructed not to eat or drink between salivary samples collection. Post rinse unstimulated salivary samples were collected at five minutes and 60 minutes intervals. All the salivary samples were transferred immediately to microbiological laboratory in sterile containers within one hour for microbiological analysis. Results: The mean Colony Forming Units (CFUs) of S. mutans with Triphala when compared to other three intervention was significantly reduced at 5 minutes and 60 minutes (p=0.001). E. officinalis showed least reduction of mean CFUs when compared to other three groups. Conclusion: It can be concluded that all four rinses were effective in reducing S. mutans CFUs, but 10% Triphala has greater efficacy than its other constituents.

Selvaraj, S. and V. R. Murty (2017). "Semi-solid state fermentation: A promising method for production and optimization of tannase from bacillus gottheilii M2S2." Research Journal of Biotechnology **12**(4): 39-48.

Tannase is an important enzyme which finds commercial applications in food industry to reduce the level of tannins in fruit juices, preparation of instantaneous tea and production of gallic acid. Various low cost tannin rich residues such as coffee husk, tamarind seed powder, tea leaves and Triphala powder were studied in semi-solid state fermentation process. Triphala was found to be a prominent substrate which has exhibited maximum tannase activity of 29 ± 0.35 U/L. Thereafter, sequential statistical approach was used to optimize tannase production with Triphala in shake flask. The classical one-variable-at-a-time approach determined moistening media, tannic acid and inoculum volume which significantly influenced the tannase production. A central composite design showed that the optimal values of these factors were 6.2 mL, 1% (w/v) and 6.4 mL respectively. Subsequently, a 7-fold increase in corresponding tannase yield (106 ± 0.61 U/L) was obtained, compared with that produced in the submerged fermentation. The crude tannase showed optimum activity at 40°C and pH 4.0. Vmax and Km values were 1.404 µmol/ml.min and 1.24 mM respectively.

Selvaraj, S., R. M. Vytla, G. S. Vijay and K. Natarajan (2019). "Modeling and optimization of tannase production with Triphala in packed bed reactor by response surface methodology, genetic algorithm, and artificial neural network." 3 Biotech **9**(7).

In this research, optimization of the production medium to enhance tannase production by Bacillus gottheilii M2S2 in laboratory-scale packed bed reactor was studied. Amount of substrate Triphala, moisture content, aeration rate, and fermentation period was chosen for optimization study. During one variable at a time optimization, the highest tannase activity of 0.226 U/gds was shown with Triphala as a substrate at the fermentation period of 32 h. Furthermore, the optimum conditions predicted by response surface methodology (RSM) and genetic algorithm (GA) were found to be 11.532 g of substrate Triphala, 47.071% of the moisture content, and 1.188 L/min of an aeration rate with uppermost tannase activity of 0.262 U/gds. In addition, the single hidden layer feedforward neural network (SLFNN) and the radial basis function neural network (RBFNN) of an artificial neural network (ANN) were adopted to compare the prediction performances of the RSM and GA. It revealed that the ANN models (SLFNN, R2 = 0.9930; and RBFNN, R2 = 0.9949) were better predictors than the RSM (R2 = 0.9864). Finally, the validation experiment exhibited 0.265 U/gds of tannase activity at the optimized conditions, which is an 11-fold increase compared to unoptimized media in shake flask.

Shaikh, S. and V. Jain (2018). "Development and validation of a RP-HPLC method for the simultaneous determination of quercetin, ellagic acid and rutin in hydroalcoholic extract of triphala churna." International Journal of Applied Pharmaceutics **10**(3): 169-174.

Objective: To develop a novel, accurate, precise and linear reverse phase high performance liquid chromatographic (RP-HPLC) method for simultaneous qualitative and quantitative estimation of quercetin, ellagic acid and rutin in an ayurvedic formulation and validate as per international conference on harmonization (ICH) guidelines. Methods: In the present work, good chromatographic separation was achieved isocratically using a shim-pack HPLC C18 column (4.6 × 250 mm, 5µm) and a mobile phase consisting of 0.02 M potassium dihydrogen orthophosphate buffer (pH adjusted to 3 with orthophosphoric acid) and methanol in the ratio 55:45, at flow rate of 1 ml/min and column temperature maintained at 35 °C. The effluents obtained were monitored at 254 nm with a UV-visible detector. Results: The retention time of quercetin, ellagic acid and rutin were found to be 7.52 min, 9.10 min and 12.47 min respectively. Linearity of quercetin, ellagic acid and rutin were found in the range of 8-12 ppm, 9-17 ppm and 7-11 ppm respectively. The correlation coefficient for quercetin, ellagic acid and rutin were 0.997, 0.999 and 0.999 respectively. The high recovery values (98 %-102 %) indicate a satisfactory accuracy. The low percent relative standard deviation (% RSD) values in the precision study reveal that the method is precise. Conclusion: The developed method is novel, simple, precise, rapid, accurate and reproducible for simultaneous quantitative estimation of quercetin, ellagic acid and rutin in an ayurvedic formulation. Hence the developed method can be used for quantitative analysis and quality control of extracts and commercial samples of other plant species and formulation containing these three markers.

Shakibaei, F., M. Borhani, M. Kahkeshani and K. Ghadimi (2018). "The effect of triphala lavender tablets on the treatment of children with attention deficit/hyperactivity disorder." Journal of Isfahan Medical School **36**(466): 42-48.

Background: Attention deficit/hyperactivity disorder (ADHD) is a common psychiatric disorder in the children. The purpose of this study was to evaluate the efficacy of Triphala Lavender tablets as an adjuvant

therapy along with methylphenidate on the treatment of children with attention deficit/hyperactivity disorder. Methods: In this clinical trial study that was done in Isfahan Province, Iran, in 2016, 44 children with attention deficit/hyperactivity disorder were enrolled according to inclusion (aged between 6 to 12 years) and exclusion (failure to follow up) criteria. The patients were randomly divided into two group as intervention (treated with methylphenidate and Triphala lavender tablets) and placebo (treated with methylphenidate and placebo). Patients were treated for 8 weeks. The assessment tool was Attention Deficit/Hyperactivity Disorder Rating Scale-IV (ADHD-RS-IV), which was used at the onset, and 2, 4, and 8 weeks after the intervention. Findings: The ADHD-RS-IV scores significantly decreased in both groups after intervention (P < 0.001 for both). In addition, the ADHD-RS-IV in the intervention group was significantly lower than placebo group at the 4th week after the intervention (P = 0.042); but there was no significant difference between the two groups in ADHD-RS-IV at onset, and 2 and 8 weeks after the intervention (P > 0.050 for all). Conclusion: The use of Triphala Lavender tablets as an adjuvant therapy may be effective in patients with attention deficit/hyperactivity disorder, but due to limited study about the role of Triphala Lavender tablets in treatment of these patients, we need future studies with larger sample sizes and longer time.

Shakouie, S., M. Eskandarinezhad, N. Gasemi, A. Salem Milani, M. Samiei and S. Golizadeh (2014). "An in vitro comparison of the antibacterial efficacy of triphala with different concentrations of sodium hypochlorite." Iranian Endodontic Journal **9**(4): 287-289.

Introduction: The antimicrobial efficacy of root canal irrigant plays an important role in increasing the success of root canal treatment (RCT). The aim of the present experimental study was to compare the antimicrobial activity of Triphala (a plant-derived solution) with 0.5, 1, 2.5 and 5% concentrations of sodium hypochlorite (NaOCl), against Enterococcus faecalis (E. faecalis). Methods and Materials: Two hundred plates of cultured E. faecalis, were divided into 5 experimental groups (n=38) and two positive and negative control groups. The antimicrobial activity of the test solutions was determined by measuring the zone of inhibition in the culture media. The mean diameter of inhibited zones between the study groups was compared using the Kruskal-Wallis test and the Mann-Whitney U test was used for the two-by-two comparison of the groups with the level of significance set at 0.05. Results: The Kruskal-Wallis test showed significant differences between the study groups (P<0.05). According to the Mann-Whitney U test the mean diameter of inhibition zones in Triphala group was significantly higher compared to 0.5 and 1% NaOCl (P<0.05). Conclusion: In this study, Triphala exhibited better antimicrobial activity against E. faecalis compared to 0.5 and 1% NaOCl (P<0.05).

Shanbhag, V. K. (2015). "Triphala in prevention of dental caries and as an antimicrobial in oral cavity- A review." Infectious Disorders - Drug Targets **15**(2): 89-97.

Dental caries is a widely prevalent infectious disease afflicting the humans worldwide. Each year oral infections such as dental caries, periodontal diseases and oral candidiasis significantly adds to the economic burden of the world. Though there are standard management techniques for these diseases; they do have side effects and are not cost effective. Ayurveda is a traditional Indian system of medicine that is being practiced in the Indian peninsula since ages. Among the various herbal medicines in ayurveda, triphala occupies a royal position due to its wide beneficial systemic actions. Triphala is a mixture of fruits of Terminalia bellirica, Terminalia chebula and Emblica officinalis. The antimicrobial actions of triphala are well documented in the literature. However availability of review articles regarding triphala as an antimicrobial against oral infections is limited. Need was felt to review this aspect of triphala. The present article reviews the use of triphala and its constituents in the prevention and control of dental caries and other common oral infections. Thorough review of the literature indicated that triphala can be effectively used to manage dental caries, gingival and periodontal diseases. Further it can also be utilized as a root canal irrigant and against oral candida species.

Shanmuganathan, S. and N. Angayarkanni (2018). "Chebulagic acid Chebulinic acid and Gallic acid, the active principles of Triphala, inhibit TNFα induced pro-angiogenic and pro-inflammatory activities in retinal capillary endothelial cells by inhibiting p38, ERK and NFkB phosphorylation." Vascular Pharmacology **108**: 23-35.

Tumor necrosis factor-α (TNFα) a pleiotropic cytokine induces pro-inflammatory and pro-angiogenic changes in conditions such as diabetic retinopathy (DR) and neovascular age related macular degeneration (NV-AMD). Hence, inhibition of TNFα mediated changes can benefit the management of DR and NV-AMD. Triphala, an ayurvedic herbal preparation is known to have immunomodulatry functions. In this study we evaluated the alcoholic extract of triphala (AlE) and its compounds Chebulagic acid (CA), Chebulinic acid (CI) and Gallic acid (GA) for their anti-TNFα activity. TNFα induced pro-inflammatory and pro-angiogenic

changes in the retinal-choroid microvascular endothelial cells (RF/6A). Treatment with CA/CI/GA and the whole Triphala extract showed characteristic inhibition of MMP-9, cell proliferation/migration and tube formation as well the expression of IL-6, IL-8 and MCP-1 without affecting cell viability. This was mediated by inhibition of p38, ERK and NFκB phosphorylation. Ex vivo angiogenesis assay using chick chorioallantoic membrane (CAM) model also showed that TNFα-induced angiogenesis and it was inhibited by AlE and its active principles. Further, in silico studies revealed that CA, CI and GA are capable of binding the TNFα-receptor-1 to mediate anti-TNFα activity. This study explains the immunomodulatory function of Triphala, evaluated in the context of retinal and choroid vasculopathies in vitro and ex vivo; which showed that CA, CI and GA can be a potential pharmacological agents in the management of DR and NV-AMD.

Shanmuganathan, S. and N. Angayarkanni (2019). "Chebulagic acid and Chebulinic acid inhibit TGF-β1 induced fibrotic changes in the chorio-retinal endothelial cells by inhibiting ERK phosphorylation." Microvascular Research **121**: 14-23.

Purpose: Diabetic retinopathy (DR) is characterized by pro-inflammatory, pro-angiogenic and pro-fibrotic environment during the various stages of the disease progression. Basement membrane changes in the retina and formation of fibrovascular membrane are characteristically seen in DR. In the present study the effect of Alcoholic (AlE) extracts of Triphala an ayurvedic herbal formulation and its chief compounds, Chebulagic (CA), Chebulinic (CI) and Gallic acid (GA) were evaluated for TGFβ1-induced anti-fibrotic activity in choroid-retinal endothelial cells (RF/6A). Method: RF/6A cells were treated with TGFβ1 alone or co-treated with AlE, CA, CI or GA. The mRNA and protein expression of fibrotic markers (αSMA, CTGF) were assessed by qPCR and western blot/ELISA. Functional changes were assessed using proliferation assay and migration assay. To deduce the mechanism of action, downstream signaling was assessed by western blot analysis along with in silico docking studies. Result: AlE (50 µg/ml) CA and CI at 10 µM reduced the expression of pro-fibrotic genes (αSMA and CTGF) induced by TGFβ1, by inhibiting ERK phosphorylation. GA did not inhibit TGFβ1 mediated changes in RF/6A cells. In silico experiments shows that CA and CI has favourable binding energy to bind with TGFβ receptor and inhibit the downstream signaling, while GA did not. Conclusion: Hence this study identifies Triphala and its chief compounds CA and CI as potential adjuvants in the management of DR.

Sharma, A., D. K. Mishra and K. Shukla (2018). "Comparative hylauronidase enzyme activity of ayurvedic formulation Triphala guggulu." Research Journal of Pharmacy and Technology **11**(2): 463-465.

A herbal formulation Triphala Guggulu was prepared based on the method described in Ayurvedic Formulary of India. It contains This triphala guggulu includes Amla (Emblica officinalis), Bibhitaki (Terminalia Bellerica), Haritaki (Terminalia Chebula), Pippali (piper longum), Guggulu (Commiphora mukul) plants. Maximum plant was used in preparation of ayurvedic formulation shows anti inflammatory activities and formulation also use for treatment of inflammation and in arthritis.The aqueous extract of TG exhibited a maximum hyaluronidase enzyme inhibition of 83.90% and marketed formulations TG-1,TG-2 and TG-3 exhibit maximum maximum hyaluronidase enzyme inhibition of 83.86%,83.87% and83.89% respectively. The results of this study suggest that the Hyaluronidase enzyme inhibition of Triphala Guggulu may explain its use in joints related problems like Rheumatoid arthritis, Gout and in inflammation of joints.

Sharma, A. and S. Shailajan (2009). "Analysis of some heavy metals from fruits of medicinal plants Phyllanthus emblica, Terminalia bellirica and Terminalia chebula from India and Nepal by ICP-OES technique." Nature Environment and Pollution Technology **8**(4): 761-763.

Heavy metals as environmental contaminants of terrestrial ecosystems is not a recent phenomenon. As certain plants have a tendency of storing heavy metals from soils, polluted water and atmosphere, heavy metals are a matter of concern in the herbal drugs. Therefore, test for heavy metals is essential for herbal medicines. Fruits of Amalaki (Phyllanthus emblica Linn.), Bibhitaki (Terminalia bellirica (Gaertn.) Roxb. and Haritaki (Terminalia chebula Retz.) are used individually or in combination as Triphala in number of formulations. Triphala and its constituents act as cardiotonic, control blood pressure, improve blood circulation and reduce cholesterol levels. Because of such wide use of these fruits in various herbal formulations, it is necessary to analyse at least common heavy metals from the raw materials before they can be processed further. To meet the heavy demand for this raw material and due to the easy accessibility, some supply also comes from neighbouring countries like Nepal and Bhutan. In the present paper fruits of Amalaki, Bibhitaki and Haritaki procured from India (Karjat) and Nepal (Baghlongh) were analysed for five heavy metals Cu, Zn, Pb and Hg by Optical Emission Spectroscopy, which uses the technique of

inductively coupled plasma. There was a significant variation in the heavy metal content of fruits collected from India and Nepal.

Sharma, A. and S. Shailajan (2009). "Simulataneous quantitation of gallic acid from fruits of Phyllanthus emblica Linn., Terminalia bellirica (Gaertn.) Roxb. and Terminalia chebula Retz." Asian Journal of Chemistry **21**(9): 7111-7116.

Fruits of Phyllanthus emblica Linn., Terminalia bellirica (Gaertn.) Roxb. and Terminalia chebula Retz. are commonly used as herbal raw materials in many Ayurvedic and herbal formulations. These fruits are either used individually or in combination known as 'Triphala'. Fruits of Phyllanthus emblica Linn., Terminalia bellirica (Gaertn.) Roxb. and Terminalia chebula Retz. have been reported to contain gallic acid. Gallic acid is a widely occurring phenolic compound of plant origin. Gallic acid is selected as a bioactive marker due to its easy availability, common presence in these fruits and as antiobesity property. Recently, the concept of marker-based standardization of herbal drugs is gaining momentum. A simple, sensitive and reliable high performance thin layer chromato-graphic method has been established for simultaneous quantification of gallic acid from fruits of Phyllanthus emblica Linn., Terminalia bellirica (Gaertn.) Roxb. and Terminalia chebula Retz. Gallic acid separation was achieved from Phyllanthus emblica Linn., Terminalia bellirica (Gaertn.) Roxb. and Terminalia chebula Retz. of different geographical regions of india and Nepal in a common mobile phase toluene:ethyl acetate:formic acid, 2:7:1 (v/v). After development, detection and quantitation of plates were performed by densitometry at 275 nm. The response to gallic acid in all the three fruits extracts was a linear function of concentration over the range 20 to 100 µjg mL-1. There was significant variation in gallic acid content of fruit collected from different regions. Gallic acid was maximum in Phyllanthus emblica Linn. collected from Dehradun (0.721%), in Terminalia bellirica (Gaertn.) Roxb. collected from Maharastra (Karjat) (0.561%) and Terminalia chebula Retz. collected from Madhya Pradesh (0.905%).

Sharma, A. and K. K. Sharma (2011). "Chemoprotective role of triphala against 1,2-dimethylhydrazine dihydrochloride induced carcinogenic damage to mouse liver." Indian Journal of Clinical Biochemistry **26**(3): 290-295.

The present study was carried out to investigate the protective role of Triphala (a combination in equal proportions by weight of fruit powder of Terminalia belerica, Terminalia chebula and Emblica officinalis) against 1,2-dimethylhydrazinedihydrochloride (DMH) induced Endoplasmic reticulum stress (ER stress) in mouse liver. An oral dose of 3 mg/kg body wt in drinking water for 5 weeks significantly ($P < 0.001$) increased the levels of serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), serum Alkaline phosphatase (ALP) and total bilirubin thus suggesting damage to mouse liver and biliary dysfunction. The DMH administration invariably led to increase in the liver microsomal proteins of molecular weight of about 29 (ERp29) and 53 kDa (ERp53) and decrease in the protein of molecular weight of 36 kDa (ERp36) thereby suggesting the interference of DMH and its metabolites with normal protein biosynthesis and folding, in the reticular membranes of the liver cells thus developing ER stress. Histological studies show necrosis, large sized hepatocytes with increased N:C ratio, aberrant mitotic figures and prominent nucleoli in the liver of DMH treated mice. In animals fed 5% Triphala in diet (w/w) during DMH administration, there was significant decrease in the above changes in the liver suggesting the suppression of DMH induced ER stress in liver. Triphala significantly ($P < 0.05$) decreased lipid peroxidation and also the activity of lactate dehydrogenase (LDH) in mouse liver. It simultaneously increased the level of reduced glutathione (GSH) and the activity of glutathione-S-transferase (GST) thereby suggesting that it prevents peroxidative damage and also diverts the active metabolites (electrophiles) of DMH from their interactions with critical cellular bio-molecules which could be responsible for its protective action against DMH.

Sharma, B. and D. K. Goyal (2015). "A comparative clinical evaluation of the efficacy of madhumeha nashini gutika & darvyadi kwath in madhumeha wsr to diabetes mellitus." International Journal of Ayurveda and Pharma Research **3**(8): 11-18.

Diabetes has become a dreadful disease in this era. It is also described in Ayurvedic texts in terms of Madhumeha. Diabetes Mellitus is disease known from the dawn of civilization. Sedentary life style, lack of exercise, faulty dietary habits, improper medication & urbanization precipitate the disease. It is estimated that the total number of people with diabetes will rise from 171 million in 2000 to 366 million by 2030. As per WHO report, currently half a billion people (12% of the world's population) are considered obese. As obesity is the one of the root cause of the disease. Observing the current status of prevalence and morbidity of the disease proper medication for the disease is mandatory. In the present study, Madhumeha Nashini Gutika a herbomineral preparation and Darvyadi Kwath (both mentioned in

Ayurvedic texts) were selected for clinical trial. The study comprised of a series of 60 patients of Madhumeha. The patients were selected from OPD and IPD of Kayachikitsa of Rishikul Government Ayurvedic P.G. College & Hospital. After evaluating the total effect of therapies it was observed that the Madhumeha Nashinh Gutika & Darvyadi Kwath (Combined therapy) provided better relief to the patients of Madhumeha in comparison to single group therapy. Darvyadi Kwath' consisting Devdaru, Daruhridra, **Triphala** and Musta. These drugs basically are Kashaya and Tikta Rasa pradhan, Ushna Veerya and Laghu Ruksha Guna, this formulation helps in eliminating vitiated kapha. It also corrects the vitiated both Medas and Kapha being the main entity of the Samprapti, thus by breaking the Samprapti (correcting the vitiation of Medas and Kapha) treats the disease. As the drug is Ushna it also increased improving the Dhatvagni, (as Ayurveda believes that the disease is Amajanya).

Sharma, L. and I. Sharma (2009). "A comparative drug trial on Santarpanottha Madhumeha Vishesha (Syndrome X)." AYU (An international quarterly journal of research in Ayurveda) **30**(1): 22-28.

Syndrome-X has emerged as an area of special interest to medical faculty as it houses worst lifestyle pathologies in one patient. There being unknown common ground to Diabetes Mellitus, Hypertension, Obesity & dyslipidemia, the nomenclature adopted is Syndrome-X. As these diseases are observed to be led by Diabetes Mellitus, the other names of the syndrome are Metabolic Syndrome & Insulin resistant syndrome. This is why the Ayurvedic name attributed is 'Santarpanottha Madhumeha Vishesha'. The present study was aimed at observing & evaluating the common Nidana along with a comparative clinical study of two herbo-mineral compounds. 100 diagnosed patients of Syndrome-X were selected and randomly divided in two groups of fifty patients each; Group-A receiving Compound - A, Whereas Group-B receiving Compound - A with Medohara (Navak) Guggulu respectively. The vehicle for both the groups was Dashamoola decoction in a dose of 40 ml twice a day for 45 days. It was observed that most patients in group -B had significant improvement in Shrama, Prabhoot mootrata, Daurbalya, Vibandha, Kanthatalu shosha, Pipasadhikya & Sada. Compound A contained Triphala among other drugs, and Medohara (Navak) Guggulu contained Triphala,Trikatu,Trimada & Guggulu.

Sharma, M. R., C. S. Mehta, D. J. Shukla, K. B. Patel, M. V. Patel and S. N. Gupta (2013). "Multimodal Ayurvedic management for Sandhigatavata (Osteoarthritis of knee joints)." AYU **34**(1): 49-55.

Vata is the governing factor in the maintenance of equilibrium in the universe as well as in the body. As age advances, the influence of Vata Dosha progresses, resulting in the process of gradual degeneration of the body. Sandhigatavata (osteoarthritis) is one of the consequences of this process, which is common in the elderly people. This is one of the major causes of chronic disability, affecting the quality of life. Prevalence of osteoarthritis in India is more among menopausal women. This study has been conducted to evaluate the efficacy of Ayurvedic multimodal management in Sandhigatavata and to provide better options to Non-Steroidal Anti-Inflammatory Drugs (NSAIDs). In present clinical trial, 50 patients of Sandhigatavata have been registered and have been given Snehana, Svedana, Mriduvirechana, Matrabasti, and Jalaukavacharana, along with oral medications like Yogaraja Guggulu and Ashvagandha Churna. Yogaraja Guggulu contains many herbs including Triphala and Trikatu. Ashvagandha Churna (root powder of *Withania somnnifera* Dunal.) 3 g with warm milk was given in morning and evening before meals. This multimodal therapy is being used in P.D. Patel Ayurved Hospital, Nadiad, since years, providing good relief to patients with Sandhigatavata. The results have been analyzed statistically by using the Student paired't' test. The therapy showed highly significant ($P < 0.001$) beneficial effect on the clinical features of Sandhigatavata. On overall effect of therapy, 4% of the patients were relieved completely, while 24% have shown marked improvement, 50% moderate improvement, and 22% mild improvement. Results of follow-up showed that marked improvement decreased, but moderate improvement was steady. Continuing the study on a larger number of patients, with inclusion of more objective parameters to get better conclusions is suggested at the end of the study.

Sharma, R. K. and P. S. Patki (2010). "Double-blind, placebo-controlled clinical evaluation of an Ayurvedic formulation (GlucoCare capsules) in non-insulin dependent diabetes mellitus." Journal of Ayurveda and Integrative Medicine **1**(1): 45-51.

Diabetes mellitus describes a metabolic disorder of multiple etiologies characterized by insulin resistance, relative insulin deficiency and hyperglycemia with disturbances of carbohydrate, fat and protein metabolism. The goal for treatment of diabetes is to prevent its acute manifestations and long-term microvascular and macrovascular complications. The present study was conducted to evaluate the efficacy and safety of an Ayurvedic formulation (GlucoCare Capsules) in non-insulin dependent diabetes mellitus. Fifty NIDDM patients of pitta-kapha prakriti attending the outpatient department of the Government

Ayurvedic Medical College, Guwahati, Assam, India were included in the study, and randomly divided into 2 groups, GlucoCare and placebo. The drug contains Triphala, Trikatu and Tinospora cordifolia among others. All received either GlucoCare or placebo in a dose of 2 capsules twice daily, before meals for 3 months. All 50 patients completed the study-no drop outs, withdrawals or patients lost to follow up. The GlucoCare group showed significant improvement in symptoms from the 2nd month till the end of the study. GlucoCare was well tolerated by all patients throughout the treatment period with no evidence of adverse effects. The study indicates clinical efficacy of GlucoCare Capsules in the management of NIDDM in those belonging to pitta-kapha prakriti. The formulation is well tolerated and appears safe in the dosage used.

Sharma, S. (2015). "Triphala Powder: A Wonder of Ayurveda." International Journal of Recent Research Aspects **2**(1): 107-111.

Triphala is one of the most important formulation that is used worldwide as a remedy for constipation. Beside laxative properties it also have large number of other benefits that includes anticancer and antiageing properties. Each constituents of Triphala have medicinal values against various ailments. So combination of these three ingredients make Triphala a wonder drug and often regarded as elixir of life.

Sharma, S., M. Gupta and R. Bhadauria (2014). "Phytochemical variations in commercially available triphala powder: A well known dietary supplement of indian system of medicine." Research Journal of Medicinal Plant **8**(5): 214-222.

This study was aimed to evaluate the phytochemical profile and variability among1 marketed Triphala powder samples. The results showed that Triphala powder is laden with high amount of phenolics, tannins, ascorbic acid along with total sugar and starch. A remarkable variation was observed among phytoconstituents of the top ten most popular brands. Total phenolics were recorded in the range of 21.15±1.13 to 44.80±0.50% while tannin was in the range of 18.83±0.61 to 40.59±0.61%. A good amount of ascorbic acid (0.041±0.002 to 0.164±0.002%) was also present in the Triphala powder. Nutritional analysis revealed remarkable variations in sugar (3.22±0.88 to 13.65±0.50%) and starch (3.29±0.20 8.24±0.12%) content. Some phytoconstituents that were recorded in higher concentration in the first year of study were in lesser amount during the second year of the study or vice versa.

Sharma, S., M. Gupta and R. Bhadauria (2015). "Quality evaluation of commercially available Triphala powder: A renown dietary supplement of Indian system of medicines." Quality Assurance and Safety of Crops and Foods **7**(5): 599-611.

Use of herbal formulations is increasing day by day. Triphala also witnessed the increase in demand due to its various therapeutic uses. This led to the availability of a number of brands in the market. Being a plant based formulation it is highly vulnerable to adulteration and contamination that can finally alter the efficacy of the product and may pose serious health risks for consumers. In this study various physicochemical and phytochemical parameters were studied to assess the quality of the marketed product. Morphological and microscopic characteristics of the Triphala powder samples showed the adulteration of powdered endocarp of the ingredients. A variation was also observed in pH and moisture values. Excluding one or two samples, ash values were found within permissible limits. Samples of all categories of manufacturers were found contaminated with various fungal species and the majority of them exceeding the permissible limit of 103 spores/g for the medicinal formulation of internal uses as set by the World Health Organization. A remarkable variation in therapeutically important phytoconstituents was also observed among the samples of popular brands. Findings of this study suggest for formulation of stringent quality control guidelines for herbal formulations so that maximum benefits can be obtained from these traditional formulations.

Sharma, S., M. Gupta, R. Bhadauria and S. P. Bajpai (2016). "Biodeterioration of therapeutically important phytoconstituents and nutrients of stored triphala powder by associated fungal species." Journal of Pharmaceutical Sciences and Research **8**(5): 279-288.

The study was aimed to investigate the associated mycobiota and their effect on the quality of Triphala powder. Results showed the presence of various fungal species in commercially available Triphala powder with varying degree of CFU (colony forming unit) and frequency of occurrence. Aspergillus was recorded as the most dominant genus with five species. A large variation in quantity of phytoconstituents was observed among commercially available Triphala powder samples. Artificially infested samples showed the variation in the level of therapeutically important phytoconstituents after different storage periods. The study proved the role of fungal species in depletion of phytoconstiuents during storage although the capability to degrade the phytoconstituents varied from species to species.

Sharma, U., K. K. Sharma and M. Bohra (2015). "A comparative study of efficacy of two different samples of Amrita guggulu in the management of vata-rakta." World Journal of Pharmacy and Pharmaceutical Sciences (WJPPS) **4**(6): 589-603.

Vata-rakta is the major example of Vata Vyadhi, caused due to Avarana pathology. The literature enlists a number of Guggulu Prayogas in the management of Vata-rakta. In Chakradutta, Vatavyadhi Rogaadhikaar, Chapter 23, two types of Amrita Guggulu, Pratham and Dwitiya, here named Sample I and Sample II are described. This is a single-blind comparative clinical study with a pretest and post-test design, wherein a minimum of 60 patients of both sex, suffering from Vata-rakta, in an age limit of 20 to 60 years, were selected and randomly categorized into two groups. Amrita Guggulu contained Guggulu (Commiphora mukul), Triphala (Terminalia chebula Retz, Terminalia bellerica, Emblica officinalis), Guduchi (Tinospora cordifolia) etc. The 30 patients of group A were treated with oral administration of Tab Amrita Guggulu Sample I 500 mg thrice a day and the group B patients with Tab Amrita Guggulu Sample II of the same dose pattern with Anupana of Amritaadi Kashaya 72 ml with each dose. The therapeutic effect of the treatment was assessed in both the groups based on specific subjective and objective parameters. The results obtained were analyzed statistically in both the groups. In both the groups, statistically significant improvement was observed in all the criteria of assessment. The outcome of the study revealed a better therapeutic efficacy of Amrita Guggulu Sample II than Amrita Guggulu Sample I in Vata-rakta. The use of Amrita Guggulu Sample II as Shamana Aushadha was a perfect selection in the management of Vata-rakta.

Sharma, V. and A. K. Chaudhary (2015). "Pharmaceutical standardization of a novel anti leukemic Ayurvedic herbomineral formulation." International Journal of Pharmaceutical & Biological Archive **6**(1): 49 - 58.

The aim of this pharmaceutical study was to develop standard manufacturing process of Leukchem 14, a novel herbo-mineral formulation, which was designed for the treatment of Leukemia. The drug consists in specific proportions of dried powders of Ashwagandha (Withania somnifera Dunal.) root, Bilwa (Aegle marmelos Carr.) fruit pulp, Guduchi (Tinospora cordifolia (Willd) Miers.) stem, Haridra (Curcuma longa Linn.) rhizome, Kanchanar (Bauhinia variegata Blume) stem bark and Triphala and mineral drugs viz. Samaguna Kajjali (black sulphide of purified Mercury) and Shuddha Manahshila (purified Realgar). By adopting the principles of Kharaliya Rasayana, the homogenous mixture was prepared with these drugs, which was further levigated with fresh cow urine and decoction of Manjishtha (Rubia cordifolia Linn.) root respectively each three times in three batches. During the procedures of Shodhana and Bhavana, there were various physicochemical changes were observed. In first step, 317.82, 319.25, and 318.0 g of weight with the Bhavana of Gomutra was obtained from 306.50 g of basic homogenous mixture of herbal Churna, Kajjali and Shuddha Manahshila in I, II, and III batches respectively. In second step, 244.79, 241.72, and 243.00 g of Leukchem 14 with the Bhavana of Manjishtha Kwatha was obtained from 200 g of Gomutra Bhavita materials in I, II, and III batches respectively. The percentage increase in weight was observed after levigation with both the media progressively, 3.87 % by cow urine and 21.59% by Manjishtha Kwatha. At the end of Pharmaceutical study, dark brown coffee coloured powder was obtained.

Shekhar, C., K. Reddy and K. Bansal (2017). "Triphala Described as an Antidiabetic Agent in Ayurveda Treatises: A Review." Asian Journal of Pharmaceutics **11**(4): S685-S689.

Shi, Y., R. P. Sahu and S. K. Srivastava (2008). "Triphala inhibits both in vitro and in vivo xenograft growth of pancreatic tumor cells by inducing apoptosis." BMC Cancer **8**.

Background: Triphala is commonly used in Ayurvedic medicine to treat variety of diseases; however its mechanism of action remains unexplored. This study elucidates the molecular mechanism of Triphala against human pancreatic cancer in the cellular and in vivo model. Methods: Growth-inhibitory effects of Triphala were evaluated in Capan-2, BxPC-3 and HPDE-6 cells by Sulphoradamine-B assay. Apoptosis was determined by cell death assay and western blotting. Triphala was administered orally to nude mice implanted with Capan-2 xenograft. Tumors were analyzed by immunohistochemistry and western blotting. Results: Exposure of Capan-2 cells to the aqueous extract of Triphala for 24 h resulted in the significant decrease in the survival of cells in a dose-dependent manner with an IC50 of about 50 μg/ml. Triphala-mediated reduced cell survival correlated with induction of apoptosis, which was associated with reactive oxygen species (ROS) generation. Triphala-induced apoptosis was linked with phosphorylation of p53 at Ser-15 and ERK at Thr-202/Tyr-204 in Capan-2 cells. Above mentioned effects were significantly blocked when the cells were pretreated with an antioxidant N-acetylcysteine (NAC), suggesting the involvement of ROS generation. Pretreatment of cells with pifithrin-α or U0126, specific inhibitors of p53 or MEK-1/2, significantly attenuated Triphala-induced apoptosis. Moreover, NAC or U0126 pretreatment significantly

attenuated Triphala-induced p53 transcriptional activity. Similarly, Triphala induced apoptosis in another pancreatic cancer cell line BxPC-3 by activating ERK. On the other hand, Triphala failed to induce apoptosis or activate ERK or p53 in normal human pancreatic ductal epithelial (HPDE-6) cells. Further, oral administration of 50 mg/kg or 100 mg/kg Triphala in PBS, 5 days/ week significantly suppressed the growth of Capan-2 pancreatic tumor-xenograft. Reduced tumor-growth in Triphala fed mice was due to increased apoptosis in the tumors cells, which was associated with increased activation of p53 and ERK. Conclusion: Our preclinical studies demonstrate that Triphala is effective in inhibiting the growth of human pancreatic cancer cells in both cellular and in vivo model. Our data also suggests that the growth inhibitory effects of Triphala is mediated by the activation of ERK and p53 and shows potential for the treatment and/or prevention of human pancreatic cancer.

Shivaprasad, H. N., M. D. Kharya and A. C. Rana (2008). "Antioxidant and adaptogenic effect of an herbal preparation, Triphala." Journal of Natural Remedies **8**(1): 82-88.

Objective: To investigate the antioxidant and adaptogenic activities of Triphala, an Indian Ayurvedic medicinal preparation. Materials and Methods: Antioxidant activity of Triphala was determined by hydroxyl and nitric oxide radical scavenging methods. Adaptogenic activity was studied using swim endurance, anoxic stress tolerance and chronic stress induced behavioral despair test models. Triphala was administered at the dosage levels of 100 to 500 mg/kg b.w.p.o. Results and Discussion: Triphala was found to scavenge hydroxyl and nitric oxide radicals in vitro. The IC50 value for hydroxyl radical scavenging was 40:5 µg/mL and that for nitric oxide radical scavenging was found to be 40 µg/mL, respectively. Oral administration of Triphala formulation significantly improved the stress tolerance by increasing the swim duration (762.28 ± 7.17 minute), anoxic stress tolerance duration (39.11 ± 1.05 minute) and reduced the stress induced increase in the immobility period (61.11 ± 3.42 seconds) in chronic shock induced stress. Conclusion: Triphala has been found to be an excellent scavenger of hydroxyl radicals and nitric oxide radicals, whose excessive formation is implicated in oxidative stress. Triphala is capable of increasing the capacity to tolerate non-specific stress in experimental animals as evident from the restoration of parameters studied during different types of stress models.

Singh, D., N. Chauhan, S. S. Sawhney and R. M. Painuli (2011). "Biochemical characterization of triphala extracts for developing potential herbal drug formulation for ocular diseases." International Journal of Pharmacy and Pharmaceutical Sciences **3**(SUPPL. 5): 516-523.

In recent years, multiple drug resistance has been developed due to indiscriminate use of existing drugs in the treatment of infectious diseases. The major thrust is to establish alternative antimicrobial agent in order to treat microbial infections with less or no toxicity and less or negligible side effects. The herbal medicines have shown potential to overcome the limitation associated with conventional drugs. One such herbal drug is triphala (formula consists of three myrobalans) that possesses potential pharmaceutical activities and used in several ayurvedic formulations. The present work focused on study of triphala in ophthalmic disorder management; to reduce growth of microorganisms, minimizing the risk of infection, while optimizing the conditions to encourage healing. In our study we found, ethyl acetate and acetone extracts of triphala have better bactericidal and antioxidant property than methanolic extract. Furthermore, cytotoxic effect of triphala was checked on monolayer corneal cells (SIRC). The cells were found to be metabolically active in presence of triphala extract with negligible cytotoxicty. The cell morphology and cell viability was evaluated by staining the cell nuclei using DAPI and Hoechst stain respectively. These results suggested the safety and efficacy of these extract in formulation of the new drug. These findings may provide scientific rationale for the use of triphala as a new drug compound for preparation of eye drops, also as potential antioxidant and antimicrobial agent.

Singh, D. P., R. Govindarajan and A. K. S. Rawat (2008). "High-performance liquid chromatography as a tool for the chemical standardisation of triphala - An ayurvedic formulation." Phytochemical Analysis **19**(2): 164-168.

Triphala is an anti-oxidant-rich herbal formulation containing fruits of Emblica officinalis, Terminalia chebula and T. belerica in equal proportions. The preparation is frequently used in Ayurvedic medicine to treat diseases such as anaemia, jaundice. constipation, asthma, fever and chronic ulcers. Anti-mutagenic effects of the polyphenolic fractions isolated from Triphala have been reported, thus indicating that the phenols present in the formulation might be responsible for its therapeutic efficacy. A simple high-performance liquid chromatography method for the separation and quantitative determination of the major anti-oxidant polyphenols from Triphala has been developed. The use of an RP 18 column with an acidic mobile phase enabled the efficient separation of gallic acid, tannic acid, syringic acid and epicatechin along with ascorbic acid within a 20 min analysis. Validation of the method was performed in order to

demonstrate its selectivity, linearity, precision, accuracy and robustness. In addition, optimisation of the complete extraction of phenoic compounds was also studied.

Singh, D. P. and D. Mani (2015). "Protective effect of Triphala Rasayana against paracetamol-induced hepato-renal toxicity in mice." Journal of Ayurveda and Integrative Medicine **6**(3): 181-186.

Background: Paracetamol, a widely used analgesic and antipyretic, is known to cause liver and renal injury in humans when administered in higher and repeated doses that cause acute liver injury. Triphala is a well-known Ayurvedic Rasayana formulation that is prescribed for balancing of Vata, Pitta and Kapha. Traditionally, it is used for the treatment of liver and kidney diseases. Objective: The present study was undertaken to examine the protective effect of Triphala extract against paracetamol-induced hepato-renal injury in Swiss albino mice. Materials and Methods: Swiss albino mice (weight 20-25 g) were used in this study. The mice were divided into five groups of six animals each. The aqueous extract of Triphala was given orally at two different doses (100 and 300 mg/kg body weight) for seven consecutive days, followed by a single intraperitoneal injection of paracetamol (500 mg/kg body weight) to induce hepato-renal toxicity. Serum levels of liver enzymes, aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), bilirubin, creatinine, urea and uric acid were measured as indices of liver and renal injury. Statistics: All the statistical analyses were performed with the help of one-way analysis of variance (ANOVA) followed by Student-Newman-Keuls test as post hoc test. Results were considered statistically significant when $P < 0.05$. Results: Pre-treatment with Triphala extract at 100 mg/kg and 300 mg/kg body weight exhibited a significant ($P < 0.01$) hepatoprotective activity. The protective effect of Triphala extract at 300 mg/kg body weight appears more effective than 100 mg/kg body weight. The present study gives an evidence of the protective role of Triphala extract against paracetamol-induced hepato-renal toxicity and validates its traditional claim in the Ayurveda system.

Singh, E., S. Sharma, A. Pareek, J. Dwivedi, S. Yadav and S. Sharma (2012). "Phytochemistry, traditional uses and cancer chemopreventive activity of Amla (Phyllanthus emblica): The Sustainer." Journal of Applied Pharmaceutical Science **2**(1): 176-183.

Ayurveda, which is the oldest health system in the world, appreciates and uses amla to treat a host of diseases and promote positive health. Amla [Emblica officinalis, or emblic myrobalan], is called amalaki in Sanskrit. It is extensively used as a rejuvenator in ayurveda. It is also used widely in combination with other two [chebulic and belleric] myrobalans [fruit-bearing plant species] as triphala. Amla is indeed, the key ingredient in the popular ayurvedic recipe, Chyavanaprasha. More than anything, it may be called as "King of Rasayana" [rejuvenation], owing to its multiple health benefits. Phyllanthus emblica or Indian gooseberry (Amla) possesses a vastethnomedical history and represents a phytochemical reservoir of heuristic medicinal value. It is one of the oldest oriental medicines mentioned in Ayurveda as potential remedy for various ailments. The fruit is rich in quercetin, phyllaemblic compounds, gallic acid, tannins, flavonoids, pectin and vitamin C and also contains various polyphenolic compounds. A wide range of phytochemical components including terpenoids, alkaloids, flavonoids, and tannins have been shown to posses' useful biological activities. Many pharmacological studies have demonstrated the ability of the fruit shows antioxidant, anticarcinogenic, antitumour, antigenotoxic, antiinflammatory activities, supporting its traditional uses. In this review, we have focused our interest on phytochemistry, traditional uses, cancer chemopreventive activity of Phyllanthus emblica both in vivo and in vitro. In view of its reported pharmacological properties and relative safety, P. emblica could be a source of therapeutically useful products.

Singh, M. P., S. Vashisht, V. Chawla and P. Kumari (2017). "Wound healing activity of triphala in experimentally induced diabetic rats." Indian Drugs **54**(4): 70-75.

Aim of the present study was to explore the wound healing potential of Triphala extract. Triphala ointment (15% w/w) was used in the study for excision wound model. For dead space wound model Triphala extract (200 mg/kg) was administered orally. Extract of Triphala topically applied in excision wound model was found to possess wound healing property. On day 11th, the extract treated animals showed wound contraction to the extent of 87.63% and 94.77%, compared with control group of animals. In dead space wound model, oral administration of the extract was found to increase the wet and dry granuloma weight of tissue. The extract treated animals showed high quantity of hydroxyproline content when compared with the control group animals. The topical and oral administration of Triphala extract promotes diabetic wound healing in streptozotocin induced diabetic rats with increased rate of wound contraction and collagen turnover.

Singh, N., S. Mahajan, S. K. Subramani, D. Yadav, L. Singh and G. Prasad (2015). "Triphala improves glucose homeostasis by alleviating atherogenic lipids and oxidative stress in human Type 2 diabetes mellitus." International Journal of Ayurvedic Medicine **6**(3): 212-219.

'Triphala' constituting equal parts of three medicinal dried plant fruits Emblica officinalis Gaertn., Terminalia chebula Retz. and Terminalia bellerica Gaertn. is an antioxidant rich Ayurvedic formulation. The present study assessed therapeutic as well as protective effects of Triphala on human subjects with Type 2 diabetes mellitus (T2DM) and Impaired glucose tolerance (IGT). Triphala at a dose of 5 gms BD was administered to two cohorts viz., IGT, N= 20 and T2DM, N=30 consecutively for a period of 12 months. The therapeutic efficacy was assessed quarterly by monitoring blood glucose and lipid levels; the protective effect by monitoring antioxidants level quarterly and DNA damage annually. Toxicity if any, to liver and kidney due to long term administration was assessed quarterly in both cohorts. Continuous 'Triphala' therapy for 12 months significantly reduced blood glucose (p≤0.001) and li-pid levels (p≤0.05) in both the cohorts. Triphala resisted oxidative stress generated during the course of hypergly-cemia by significantly increasing the activity of super oxide dismutase and Catalase (p≤0.001) and the level of re-duced glutathione (p≤0.001). Protective effect on DNA was accessed through significant reduction in the comet tail length (p≤0.001). In conclusions, 'Triphala' ameliorated not only the oxidative stress but also normalized glucose and lipid homeosta-sis in subjects with impaired glucose and T2DM.

Singh, R., B. Singh, N. Kumarb and S. Arora (2010). "Antioxidant activity of triphala a combination of terminalia chebula, Terminalia bellerica and Emblica officinalis." Journal of Food Biochemistry **34**(SUPPL. 1): 222-232.

The antioxidant, deoxyribose (site specific and nonsite specific) degradation, reducing power, chelating power and lipid peroxidation activities of Triphala powder extracted sequentially with methanol, acetone and chloroform were studied. The methanol and acetone extracts exhibited good antioxidant potential than the chloroform extract. The inhibitory potential was correlated with the total phenolic content in the respective extracts. It was observed that fractions were rich in polyphenolic content, thereby showed comparatively more effect than crude extract having less phenolic content. © 2010, The Author(s). Journal compilation.

Singh, T. R., L. N. Gupta and N. Kumar (2016). "Standard manufacturing procedure of Teekshna lauha bhasma." Journal of Ayurveda and Integrative Medicine **7**(2): 100-108.

Background Lauha bhasma is one of the herbo-metallic preparations used in Ayurveda, a traditional Indian system of medicine for treating various ailments such as anemia, diarrhea, hyperlipidemia and diabetes. Objective To establish standard manufacturing procedure of Teekshna lauha bhasma and analyze its physico-chemical properties. Materials and methods The preparation of T. lauha bhasma (calx of iron [Fe] turning) involves samanya shodhana, vishesha shodhana followed by bhanupaka, sthalipaka and putapaka with Triphala kwatha as a medium under temperature of 650 °C in electric muffle furnace (EMF) and maintained for 1 h. T. lauha bhasma were subjected to different physico-chemical characterization using X-ray fluorescence spectrophotometer and scanning electron microscopy. Results and discussion The results suggest that these steps are necessary to obtain a good quality of bhasma and also make it acceptable for trituration during Bhasmikarana process. It is found that T. lauha bhasma was prepared properly in 20 puta at a temperature of 650 °C. The particle size of 20 puta T. lauha bhasma is 100–500 nm in range. Conclusion Pharmaceutical procedures given in Ayurvedic texts are necessary to prepare pakwa jambu phala varna T. lauha bhasma that complies with all the classical bhasma pariksha and modern analytical parameters in 20 puta at a temperature of 650 °C maintained for 1 h in EMF.

Singhal, P., T. Nesari and G. S. Gupta (2015). "Efficacy of herbomineral compounds and pathya (Ayurvedic dietary regime and physical exercise) in the management of Yakṛt Roga (Non-alcoholic fatty liver disease)." Ancient science of life **34**(4): 216-222.

Nonalcoholic fatty liver disease (NAFLD) also called as hepatic steatosis is a manifestation of excessive triglyceride accumulation in the liver. NAFLD has been described by histological features ranging from simple fatty liver, nonalcoholic steatohepatitis, progressive fibrosis, and liver failure. The objective was to evaluate the effect of herbomineral drugs and pathya (Ayurvedic dietary regime and physical exercise) in the management of NAFLD. It is a randomized, retrospective, open-ended study. A total of 32 patients presenting with raised alanine transaminase (>1.5 times normal levels) combined with sonological evidence of fatty liver in the absence of any other detectable cause of liver disease were included in the study. The recruited patients were randomly divided into two groups - The patients in Group-A (n = 21) were given a combination of herbomineral drugs Ārogyavardhinī vaṭi and Triphalā Guggulu along with prescription of pathya (Ayurvedic dietary regime and physical exercise); the patients in Group-B (n = 11)

were advised only pathya. Group-A (combined therapy group) showed statistically significant improvement in clinical symptoms, biochemical parameters-liver function test, lipid profile, fasting blood sugar, and body mass index (P < 0.001) in comparison to Group-B (pathya group). Probable mode of action: Ārogyavardhinī vaṭi contains Kaṭukā (Picrorhiza kurroa) as the major ingredient (50%). Kaṭukā is titka rasa pradhāna, thus helpful in āma-pachana. Other ingredients of AV are Loha Bhasma, Tāmra, Śilajatu (Asphaltum), Guggulu (Commiphora mukul) which are having lekhanīya karma (action). Triphalā (Harītakī – Terminalia chebula; Vibhītakī –Terminalia bellerica; Āmalakī – Emblica officinalis) is dīpanīya, śleṣma-pittaghnī, meha-śothaghnī. Triphalā Guggulu is a mixture of (i) Triphalā (Harītakī – Terminalia chebula; Vibhītakī – Terminalia bellerica; Āmalakī – Emblica officinalis), (ii) Pippalī (Piper longum), and (iii) Guggulu (Commiphora mukul) combined using bhāvanā of Triphalā decoction. Triphalā has dīpanīya action of improving metabolic fire, śleṣma-pittaghnī, meha-śothaghnī (improving urinary disorders and swelling), rasāyanī (improving rejuvenating power). Pippalī is medah–kaphanāśaka (reducing body fat) and Guggulu is ati-lekhana, srotaśśodhaka (Purifier of the channels). Combination of herbomineral drugs along with pathya has shown promising results toward the effective management of this metabolic disorder.

Sireeratawong, S., K. Jaijoy and N. Soonthornchareonnon (2013). "Evaluation of anti-inflammatory and antinociceptive activity of Triphala recipe." African journal of traditional, complementary, and alternative medicines : AJTCAM / African Networks on Ethnomedicines **10**(2): 246-250.

The anti-inflammatory and antinociceptive activities of Triphala recipe were studied in animal models. Triphala recipe (4 mg/ear) significantly exhibited an inhibitory effect on the ear edema formation induced by ethyl phenylpropiolate-induced, but not on the arachidonic acid-induced ear edema in rats. Furthermore, Triphala recipe at the doses of 300, 600 and 1,200 mg/kg significantly reduced carrageenan-induced hind paw edema. Next, the anti-inflammatory action in chronic inflammation was measured using the cotton pellet-induced granuloma formation assay in rats. Triphala recipe (1,200 mg/kg) reduced neither transudative weight nor granuloma formation. It also did not affect on body weight gain and thymus weight indicating that Triphala recipe does not have a steroid-like effect. In antinociceptive study, Triphala recipe (300, 600, 1,200 mg/kg), elicited significant inhibitory effect on both phases, especially in late phase, of the formalin test in mice suggesting that the antinociceptive action of Triphala recipe may be via both peripheral and at least partly centrally acting.

Sivasankar, S., R. Lavanya, P. Brindha and N. Angayarkanni (2015). "Aqueous and alcoholic extracts of triphala and their active compounds chebulagic acid and chebulinic acid prevented epithelial to mesenchymal transition in retinal pigment epithelial cells, by inhibiting SMAD-3 phosphorylation." PLoS ONE **10**(3).

Epithelial to Mesenchymal Transition (EMT) of the retinal pigment epitheliumis involved in the pathogenesis of proliferative vitreoretinopathy (PVR) that often leads to retinal detachment. In this study, Triphala, an ayurvedic formulation and two of its active ingredients, namely chebulagic acid and chebulinic acid were evaluated for anti-EMT properties based on in vitro experiments in human retinal pigment epithelial cell line (ARPE-19) under TGFβ1 induced conditions. ARPE-19 cells were treated with TGFβ1 alone or co-treated with various concentrations of aqueous extract (AqE) (30 - 300 µg/ml); alcoholic extract (AlE) (50 - 500 µg/ml) of triphala and the active principles chebulagic acid (CA) and chebulinic acid (CI) (CA,CI: 50 - 200 µM). The expression of EMT markers namely MMP-2, αSMA, vimentin and the tight junction protein ZO-1 were evaluated by qPCR, western blot and immunofluorescence. The functional implications of EMT, namelymigration and proliferation of cells were assessed by proliferation assay, scratch assay and transwell migration assay. AqE, AlE, CA and CI reduced the expression and activity ofMMP-2 at an ED50 value of 100 µg/ml, 50 µg/ml, 100 µM and 100 µM, respectively. At these concentrations, a significant down-regulation of the expression of αSMA, vimentin and up-regulation of the expression of ZO-1 altered by TGFβ1 were observed. These concentrations also inhibited proliferation and migration of ARPE-19 cells induced by TGFβ1. EMT was found to be induced in ARPE-19 cells, through SMAD-3 phosphorylation and it was inhibited by AqE, AlE, CA and CI. Further studies in experimental animals are required to attribute therapeutic potential of these extracts and their active compounds, as an adjuvant therapy in the disease management of PVR. © 2015 Sivasankar et al.

Somayaji, S. K., N. V. Ballal, K. L. Shobha and K. G. Mohandas Rao (2014). "Comparision of antimicrobial efficacy of triphala, withania somnifera and sodium hypochlorite against enterococcus faecalis biofilm-an invitro study." International Journal of Pharmacy and Pharmaceutical Sciences **6**(SUPPL. 2): 808-811.

Objectives: To compare the antimicrobial efficacy of sodium hypochlorite, Triphala, Withania somnifera, combination of Triphala & Withania somnifera against Enterococcus faecalis (E faecalis) biofilm in extracted human teeth. Methods: Total of 40 human extracted teeth were collected & 10 were assigned

under 4 groups (n=10 in each group). E. faecalis was cultured, inoculated in Brain Heart Infusion medium & incubated for 45days along with the teeth for biofilm formation. After incubation for 45days, teeth were subjected to irrigation. They were irrigated with sodium hypochlorite (Group I), Triphala (Group II), Withania somnifera (Group III) and Triphala + Withania somnifera (Group IV). After the irrigation, teeth were analyzed for E faecalis colony forming units. 2 teeth from each group were subjected for qualitative observation under laser scanning confocal microscopy. Results: Teeth irrigated with sodium hypochlorite showed mean E faecalis colony count of 3.6± 0.193 lakhs which is significantly less when compared to colony counts in Group II and Group III which were 4.6±.003 (P<0.001) & 3.9±0.004 (P<0.001) lakhs respectively. However, combination of Triphala+Withania somnifera group showed mean E faecalis colony count of 3.7±0.004 lakhs which was not significantly different from that of group I. All the 4 experimental groups showed marked decrease in the E faecalis colony count when compared to the initial colony count of 10 ± 0.21 lakhs. Conclusion: Sodium hypochlorite, Triphala and Withania somnifera failed to eliminate bacteria completely. But, considerable reduction in growth of E. faecalis was seen in herbal extract groups. Considering the non-toxic nature and other physiological benefits of these herbal extracts, further studies need to be carried out to consider them as an alternative for sodium hypochlorite at least in the initial stages of bacterial infection.

Sonkar, N., A. Agrawal, G. Nath and C. B. Jha (2010). "Determination of microbial load in reference to stability study of Churnas (powders)." Biomedical and Pharmacology Journal **3**(1): 247-250.

The aim of broth and agar dilution methods is to determine the lowest concentration of the assayed antimicrobial agent (minimal inhibitory concentration, MIC) that, under defined test conditions, inhibits the visible growth of the bacterium being investigated. MIC values are used to determine susceptibilities of bacteria to drugs and also to evaluate the activity of new antimicrobial agents'. For the present study the trial drugs taken i.e. Haritaki Churna, Vibhitaki Churna, Amalaki Churna and Triphala Churna retain their potency i.e. no deterioration is observed in terms of physical, chemical and microbiological parameters after one month, two months, four months and six months duration in the Stability chambers -Temperature 45°C ± 2 & Relative Humidity 75% ± 5 and in ordinary conditions of temperature and humidity. This shelf life period may be applicable to other Churnas having similar method of preparation and constituents having similar range of phyto-chemicals, carbohydrates, cellulose etc.

Sowjanyaa, J., T. Thomas and C. S. Chandana (2017). "Comparative evaluation of the efficacy of smear layer removal by ethylenediaminetetraacetic acid, Triphala, and German chamomile as irrigants - A scanning electron microscopy study." Journal of Advanced Pharmacy Education and Research **7**(3): 267-271.

The desired outcome of endodontic treatment is to get rid of bacteria in the root canal and to provide a very good seal of root canal filling materials. It has been exhibited that after instrumentation of the root canal, smear layer was found covering the root canal walls. The use of herbal alternatives as a root canal irrigant is advantageous as it eliminates the undesirable characteristics of chemical irrigants. Alternative irrigants are proven to be safe and contain active constituents that have beneficial physiologic effect and curative property such as antioxidant, anti-inflammatory, and radical scavenging activity. The aim of this study is to compare the efficacy of ethylenediaminetetraacetic acid, Triphala, and German chamomile on smear layer removal of prepared root canal walls by scanning electron microscopy.

Srikumar, R., N. Jeya Parthasarathy, E. M. Shankar, S. Manikandan, R. Vijayakumar, R. Thangaraj, K. Vijayananth, R. Sheeladevi and U. A. Rao (2007). "Evaluation of the growth inhibitory activities of Triphala against common bacterial isolates from HIV infected patients." Phytotherapy Research **21**(5): 476-480.

The isolation of microbial agents less susceptible to regular antibiotics and the rising trend in the recovery rates of resistant bacteria highlights the need for newer alternative principles. Triphala has been used in traditional medicine practice against certain diseases such as jaundice, fever, cough, eye diseases etc. In the present study phytochemical (phenolic, flavonoid and carotenoid) and antibacterial activities of aqueous and ethanol extracts of Triphala and its individual components (Terminalia chebula, Terminalia belerica and Emblica officinalis) were tested against certain bacterial isolates (Pseudomonas aeruginosa, Klebsiella pneumoniae, Shigella sonnei, S. flexneri, Staphylococcus aureus, Vibrio cholerae, Salmonella paratyphi-B, Escherichia coli, Enterococcus faecalis, Salmonella typhi) obtained from HIV infected patients using Kirby-Bauer's disk diffusion and minimum inhibitory concentration (MIC) methods. T. chebula was found to possess high phytochemical content followed by T. belerica and E. officinalis in both aqueous and ethanol extracts. Further, most of the bacterial isolates were inhibited by the ethanol and aqueous extracts of T. chebula followed by T. belerica and E. officinalis by both disk diffusion and MIC methods.

The present study revealed that both individual and combined aqueous and ethanol extracts of Triphala have antibacterial activity against the bacterial isolates tested.

Srikumar, R., N. Jeya Parthasarathy and R. Sheela Devi (2005). "Immunomodulatory activity of triphala on neutrophil functions." Biological and Pharmaceutical Bulletin **28**(8): 1398-1403.

Immune activation is an effective as well as protective approach against emerging infectious diseases. The immunomodulatory activities of Triphala (Terminalia chebula, Terminalia belerica and Emblica officinalis) were assessed by testing the various neutrophil functions like adherence, phagocytosis (phagocytic index (P.I) and avidity index (A.I)) and nitro blue tetrazolium (NBT) reduction in albino rats. In recent years much attention is being focused on the immunological changes occur during stress. Noise (100 dB) stress for 4 h/d for 15 d, was employed to alter the neutrophil functions. The neutrophil function tests and corticosterone levels were carried out in eight different groups of animals, namely control, Triphala, noise-stress, Triphala noise-stress, and corresponding immunized groups were used. Sheep red blood cells (SRBC 5 × 109 cells per ml) were used for immunizing the animals that belongs to immunized groups. In Triphala administration (1 g/kg/d for 48 d), A.I was found to be significantly enhanced in the Triphala group, while the remaining neutrophil functions and steroid levels were not altered significantly. However the neutrophil functions were significantly enhanced in the Triphala immunized group with a significant decrease in corticosterone level was observed. Upon exposure to the noisestress, the neutrophil functions were significantly suppressed and followed by a significant increase in the corticosterone levels were observed in both the noise-stress and the noise-stress immunized groups. These noise-stressinduced changes were significantly prevented by Triphala administration in both the Triphala noise-stress and the Triphala noise-stress immunized groups. Hence our study has divulged that oral administration of Triphala appears to stimulate the neutrophil functions in the immunized rats and stress induced suppression in the neutrophil functions were significantly prevented by Triphala.

Srikumar, R., N. J. Parthasarathy, S. Manikandan, A. Muthuvel, R. Rajamani and R. Sheeladevi (2007). "Immunomodulatory effect of Triphala during experimentally induced noise stress in albino rats." Journal of Health Science **53**(1): 142-145.

Stress is a term that generally has a negative connotation, which results in immune dysfunction. In this study, immunomodulatory effect of Triphala (equal proportion of Terminalia chebula, Terminalia bellerica and Emblica officinalis) during noise-stress in male albino rats was evaluated by analyzing the antibody titer, cytokines IL-2-Interleukin (2), IL-4 and IFN-Interferon (gamma) and Pan T, CD4+/CD8+ lymphocyte phenotype in spleen. Four groups of rat were employed namely control, Triphala (1 g/kg body weight), noise-stress (100 dB/4 hr/15 days), Triphala + noise-stress and rats were immunized with sheep red blood cells (5 × 109 cells/ml). Results indicate that noise-stress induced elevation in the serum antibody titer and IL-4 levels associated with decreased IL-2, IFN-gamma, and reduction in Pan T, CD4 +/CD8+ lymphocyte phenotype in spleen were significantly prevented in Triphala treated noise-stress exposed group. This study showed the immunomodulatory effect of Triphala during noise-stress and suggests its therapeutic usefulness.

Srikumar, R., N. J. Parthasarathy, S. Manikandan, G. S. Narayanan and R. Sheeladevi (2006). "Effect of Triphala on oxidative stress and on cell-mediated immune response against noise stress in rats." Molecular and Cellular Biochemistry **283**(1-2): 67-74.

Stress is one of the basic factors in the etiology of number of diseases. The present study was aimed to investigate the effect of Triphala (Terminalia chebula, Terminalia belerica and Emblica officinalis) on noise-stress induced alterations in the antioxidant status and on the cell-mediated immune response in Wistar strain male albino rats. Noise-stress employed in this study was 100 dB for 4 h/d/15 days and Triphala was used at a dose of 1 g/kg/b.w/48 days. Eight different groups of rats namely, non-immunized: control, Triphala, noise-stress, Triphala with noise-stress, and corresponding immunized groups were used. Sheep red blood cells (5 × 109 cells/ml) were used to immunize the animals. Biochemical indicators of oxidative stress namely lipid peroxidation, antioxidants superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), ascorbic acid in plasma and tissues (thymus and spleen) and SOD, GPx and corticosterone level in plasma were estimated. Cell-mediated immune response namely foot pad thickness (FPT) and leukocyte migration inhibition (LMI) test were performed only in immunized groups. Results showed that noise-stress significantly increased the lipid peroxidation and corticosterone level with concomitant depletion of antioxidants in plasma and tissues of both non-immunized and immunized rats. Noise-stress significantly suppressed the cell-mediated immune response by decreased FPT with an enhanced LMI test. The supplementation with Triphala prevents the noise-stress induced changes in the

antioxidant as well as cell-mediated immune response in rats. This study concludes that Triphala restores the noise-stress induced changes may be due to its antioxidant properties.

Srikumar, R., N. J. Parthasarathy, E. M. Shankar, S. Manikandan, R. Vijayakumar, R. Thangaraj, K. Vijayananth, R. Sheeladevi and U. A. Rao (2007). "Evaluation of the growth inhibitory activities of triphala against common bacterial isolates from HIV infected patients." Phytotherapy Research **21**(5): 476-480.

The isolation of microbial agents less susceptible to regular antibiotics and the rising trend in the recovery rates of resistant bacteria highlights the need for newer alternative principles. Triphala has been used in traditional medicine practice against certain diseases such as jaundice, fever, cough, eye diseases etc. In the present study phytochemical (phenolic, flavonoid and carotenoid) and antibacterial activities of aqueous and ethanol extracts of Triphala and its individual components (Terminalia chebula, Terminalia belerica and Emblica officinalis) were tested against certain bacterial isolates (Pseudomonas aeruginosa, Klebsiella pneumoniae, Shigella sonnei, S. flexneri, Staphylococcus aureus, Vibrio cholerae, Salmonella paratyphi-B, Escherichia coli, Enterococcus faecalis, Salmonella typhi) obtained from HIV infected patients using Kirby-Bauer's disk diffusion and minimum inhibitory concentration (MIC) methods. T. chebula was found to possess high phytochemical content followed by T. belerica and E. officinalis in both aqueous and ethanol extracts. Further, most of the bacterial isolates were inhibited by the ethanol and aqueous extracts of T. chebula followed by T. belerica and E. officinalis by both disk diffusion and MIC methods. The present study revealed that both individual and combined aqueous and ethanol extracts of Triphala have antibacterial activity against the bacterial isolates tested.

Srinagesh, J., P. Krishnappa and S. N. Somanna (2012). "Antibacterial efficacy of triphala against oral streptococci: An in vivo study." Indian Journal of Dental Research **23**(5): 696.

Background: Triphala is a botanical preparation consisting of equal parts of three herbal fruits. Much revered in Ayurveda, triphala has been proven to have antibacterial, antiviral, antifungal actions. Aims and Objectives: The objective of this study was to investigate the effect of 6% triphala in a mouthwash formulation on the salivary streptococci levels at the end of 48 h and 7 days, of twice a day usage, and to compare the same with 0.2% chlorhexidine. Materials and Methods: Sixty undergraduate student volunteers aged between 18 and 25 years were randomly allocated into three study groups. (a) 6% triphala mouthwash, 15 ml twice a day; (b) 0.2% chlorhexidine mouthwash, 15 ml twice a day (active control group); (c) passive control group asked to rinse with plain water, twice a day. The oral streptococci colony forming units/ml (CFUs/ml) was assessed by inoculating blood agar with saliva samples at the end of 48 h and at 7 days. Results: The triphala group showed a 17% and 44% reduction, while the chlorhexidine group showed 16% and 45% reduction at the end of 48 h and 7 days ($P < 0.001$). The reduction in CFUs/ml seen in triphala group closely paralleled that of chlorhexidine group. Conclusion: Triphala has been used in Ayurveda from time immemorial and has many potential systemic benefits. The promising results shown by Triphala call for further investigations of its antimicrobial effects against the numerous oral microorganisms.

Srinagesh, J. and K. Pushpanjali (2011). "Assessment of antibacterial efficacy of triphala against mutans streptococci - A randomised control trial." Oral Health and Preventive Dentistry **9**(4): 387-393.

Purpose: Triphala is an ayurvedic preparation with known antimicrobial action. This study was carried out to assess the antibacterial efficacy of triphala against salivary mutans streptococci in comparison with the 'gold standard' chlorhexidine. Materials and Methods: A double blind randomised control trial was conducted among 57 volunteers who were assessed to be in the high caries risk category. They were randomly allocated into three study groups: 1) 15 ml of 6% triphala mouthwash; 2) 15 ml of 0.2% chlorhexidine (active control); 3) no mouthwash (passive control). Mouthwashes were given twice a day for 15 days. Unstimulated saliva samples were collected at baseline and at 15 and 45 days. Mutans streptococci (MS) were cultured on MSB agar and colony counts obtained. The α error was fixed at 5%. ANOVA and post-hoc LSD tests were performed using SPSS version 14. Results: After using mouthwash for 15 days, an 83% and 80% reduction and at 45 days a 67% and 65% reduction in salivary MS colony count was observed in the triphala and chlorhexidine groups, respectively ($P = 0.0001$). The control group showed an increase of 3% in MS colony count at 15 days and a reduction of 7% at 45 days. ($P = 0.116$). Conclusion: The antimicrobial action of triphala against mutans streptococci closely parallels that of chlorhexidine. It does not have the side effects commonly associated with chlorhexidine and is cost effective.

Srinagesh, J. and K. Pushpanjali (2011). "Assessment of antibacterial efficacy of triphala against mutans streptococci: a randomised control trial." Oral health & preventive dentistry **9**(4): 387-393.

Triphala is an ayurvedic preparation with known antimicrobial action. This study was carried out to assess the antibacterial efficacy of triphala against salivary mutans streptococci in comparison with the 'gold standard' chlorhexidine. A double blind randomised control trial was conducted among 57 volunteers who were assessed to be in the high caries risk category. They were randomly allocated into three study groups: 1) 15 ml of 6% triphala mouthwash; 2) 15 ml of 0.2% chlorhexidine (active control); 3) no mouthwash (passive control). Mouthwashes were given twice a day for 15 days. Unstimulated saliva samples were collected at baseline and at 15 and 45 days. Mutans streptococci (MS) were cultured on MSB agar and colony counts obtained. The α error was fixed at 5%. ANOVA and post-hoc LSD tests were performed using SPSS version 14. After using mouthwash for 15 days, an 83% and 80% reduction and at 45 days a 67% and 65% reduction in salivary MS colony count was observed in the triphala and chlorhexidine groups, respectively (P = 0.0001). The control group showed an increase of 3% in MS colony count at 15 days and a reduction of 7% at 45 days. (P = 0.116). The antimicrobial action of triphala against mutans streptococci closely parallels that of chlorhexidine. It does not have the side effects commonly associated with chlorhexidine and is cost effective.

Srivastava, A. K. (2015). "Role of Amrita Guggulu in the management of Vata-rakta - A Clinical Trial." International Journal of Pharmaceutical & Biological Archive **5**(4): 45 - 51.

In the present revolutionary era the life of a person is hectic and materialistic. For the survival of fitness, the men expected to remain healthy physically as well as mentally. It is quite difficult due to the various obstacles which are experienced by men during his routine life. The disease Vata-rakta is one of them. It is a burning problem of present era. It has attracted the attention of world's scientists working on the problem, not due to its fatality but due to its remote complications and sequels. If the chronic condition is not treated properly the deformity of joints and cartilages cripples a person throughout his life. Vata-rakta is an ailment where both Vata and Rakta are responsible to lead a complex effect on the joint and produces Vata-rakta. Vata-rakta is a disease of joints and its clinical onset is from great toe which later spreads over other joints of the body. In Chakradutta, Vatavyadhi Rogaadhikaar, Chapter 23, Amrita Guggulu is described. Amrita Guggulu Pratham described therein is taken here for the treatment of Vatarakta. The drug consists mainly of ingredients like Guggulu (Commiphora mukul), Triphala (Terminalia chebula Retz, Terminalia bellerica, Emblica officinalis), Guduchi (Tinospora cordifolia). This is a single-blind clinical study with a pre-test and post-test design, wherein a minimum of 30 patients of both sex, suffering from Vata-rakta, in an age limit of 20 to 60 years, were selected randomly and given Amrita Guggulu with an Anupaana of Amritaadi Kashaya72 ml with each dose. The therapeutic effect of the treatment was assessed based on specific subjective and objective parameters. The results obtained were analyzed statistically. In this, statistically significant improvement was observed in all the criterion of assessment.The use of Amrita Guggulu as Shamana Aushadha was a perfect selection in the management of Vata-rakta. As a preliminary study, it has paved the further scope of study with bigger sample size in management of Vata-rakta.

Sujata, N., S. Kumar, G. D. Gupta and N. Rai (2008). "Hepato-Protective Effect of Triphala in Infective Hepatitis (Hepatitis B): A Clinical and an Experimental Study." AYU (An international quarterly journal of research in Ayurveda) **29**(3): 176-180.

"Are we sitting at the Volcano? Time to wake up." Liver is the hub of wheel of life. Liver is one of the extensively explored areas in Modern Medicine. Among the various diseases affecting it, Hepatitis-B virus infection is the most common cause. The clinical symptoms of Hepatitis-B are similar with those described under Kamala Roga in Ayurveda. Hepatitis-B, because of its potential to cause life-threatening complications like Cirrhosis, Ascites, and Hepatocellular Carcinoma, has been kept on the top of National Agenda in Public Health Administration. Hepatitis-B virus infects more than 2 billion people worldwide, out of which 360 millions are chronic carriers annually1 . It is the 10th leading cause of mortality and Hepatocellular Carcinoma is the 5th most common cancer in the world which accounts for 1.2 millions deaths globally every year2 . Western Medicine, despite its enormous success does not offer any promising cure and here the role of traditional systems of medicine cannot be overlooked. Ayurveda, the ancient science of life is enriched with ample amount of herbal drugs, which are tested and trusted and subjected to thorough clinical and experimental studies. The drugs have been proved safe and highly efficacious with almost no side effects and have been included in Pub-Med India and National Index of Medicine. A trial has been conducted as part of research program to evaluate the role and efficacy of Triphala in the management of Hepatitis-B. Total 44 cases of Hepatitis-B were registered, out of which 38 cases

completed the treatment schedule .The result of treatment were found satisfactory in terms of clinical and biochemical parameters. Moreover, Experimental Study has also been carried to substantiate the above clinical findings and also evaluate the mode of action of trial drug.

Sumantran, V. N., A. A. Kulkarni, A. Harsulkar, A. Wele, S. J. Koppikar, R. Chandwaskar, V. Gaire, M. Dalvi and U. V. Wagh (2007). "Hyaluronidase and collagenase inhibitory activities of the herbal formulation Triphala guggulu." Journal of Biosciences **32**(4): 755-761.

Myrrh (guggulu) oleoresin from the Commiphora mukul tree is an important component of antiarthritic drugs in Ayurvedic medicine. Clinical data suggest that elevated levels of hyaluronidase and collagenase type 2 enzymes contribute significantly to cartilage degradation. Triphala guggulu (TG) is a guggulu-based formulation used for the treatment of arthritis. We assessed the chondroprotective potential of TG by examining its effects on the activities of pure hyaluronidase and collagenase type 2 enzymes. Triphala shodith guggulu (TSG), an intermediate in the production of TG, was also examined. A spectrophotometric method was used to assay Hyaluronidase activity, and to detect potential Hyaluronidase inhibitors. Aqueous and hydro-alcoholic extracts of TSG showed weak but dose-dependent inhibition of hyaluronidase activity. In contrast, the TG formulation was 50 times more potent than the TSG extract with respect to hyaluronidase inhibitory activity. A validated X-ray film-based assay was used to measure the gelatinase activity of pure collagenase type 2. Hydro-alcoholic extracts of the TG formulation were 4 times more potent than TSG with respect to collagenase inhibitory activity. Components of Triphala were also evaluated for their inhibitory activities on hyaluronidase and collagenase. This is the first report to show that the T2 component of Triphala (T. chebula) is a highly potent hyaluronidase and collagenase inhibitor. Thus, the TG formulation inhibits two major enzymes that can degrade cartilage matrix. Our study provides the first in vitro preclinical evidence of the chondroprotective properties of TG..

Sumathi, P. and A. Parvathi (2010). "Antibacterial potential of the three medicinal fruits used in Triphala: An ayurvedic formulation." Journal of Medicinal Plants Research **4**(16): 1682-1685.

The present investigation is focused on antibacterial potential of dimethyl sulphoxide (DMSO) extracts from fruits of Emblica officinalis Gaertn., Terminalia bellerica Roxb. and Terminalia chebula Retz. against Salmonella typhi (32 strains) isolated from different human pathogens in agar dilution technique. DMSO fruit extracts of E. officinalis showed potent antimicrobial activity against S. typhi whereas T. bellerica was found to be highly effective against S. typhi. Crude fruit extract of T. chebula also showed significant antibacterial activity against 32 different strains of S.typhi.

Susan, A., A. Bharathraj, M. Praveen, N. Mohan Kumar and J. Karunakaran (2019). "Intraradicular Smear Removal Efficacy of Triphala as a Final Rinse Solution in Curved Canals: A Scanning Electron Microscope Study." Journal of Pharmacy and Bioallied Sciences **11**(6): S420-S428.

Aim: This study aimed to compare smear layer removal ability of different solutions of Triphala (TA) when used in specific irrigant protocols in curved canals. Materials and Methods: Seventy-four mandibular first molars with 25-35degrees of curvature of mesial roots were selected and standardized, and canals were prepared. As the initial rinse solution (8mL), 5% sodium hypochlorite was used. Samples were divided into control (Group I-normal saline, Group II-17% ethylenediaminetetraacetic acid) and experimental (Group III, IV, V, VI, VII, VIII, and IX) groups based on the type of final rinse solution (5mL) used, that is, TA-premixed (P), TA-(P)-sonic, TA-(P)-ultrasonic, 3% TA solution, 5% TA solution, 10% TA solution, and 10% citric acid. Samples were dehydrated, split buccolingually, splutter coated, and examined in field emission scanning electron microscope. Results: Among the experimental groups, Group V presented the least amounts of smear and debris in all thirds of the root canal with mean values of 1.6±0.63 and 1.6±0.62, respectively, and on comparison with Group II the results were comparable, and no significant difference was found statistically (P 0.05). Group V presented with the highest amount of erosion with loss of peritubular and intertubular dentin at all levels with mean values of 1.60±0.51. Conclusion: The use of TA as a final rinse solution during biomechanical preparation seems promising.

Sushma, D. S., P. J. Shenoy, M. S. Rukmini, N. Salian, S. Rai, V. Sayeli and S. Takodara (2016). "Effect of triphala on a murine model of isoniazid and rifampicin induced model of hepatotoxicity." Research Journal of Pharmaceutical, Biological and Chemical Sciences **7**(1): 618-624.

The aim of the study was to evaluate the effect of triphala on murine model of isoniazid and rifampicin induced hepatotoxicity. Thirty wistar rats of either sex, weighing 150-250 g were randomly divided into five groups of six animals each - Normal control, hepatotoxic control, Triphala 250mg group, Triphala 500mg group and standard control. Hepatotoxicity was induced in all groups except normal control, by

administering isoniazid 100mg/kg body weight intraperitoneally and rifampicin 100mg/kg body weight orally, for 21 days. Triphala 250mg, Triphala 500mg and standard control groups were treated simultaneously with Triphala at doses 250mg/kg/500 mg/kg and Silymarin2.5mg/kg respectively for 21 days. The blood samples were collected by cardiac puncture under ether anesthesia, for biochemical estimation of liver enzymes, total proteins, albumin, total and direct bilirubin. Subsequently, the rats were sacrificed and the liver was dissected for histopathological evaluation. The hepatotoxic group showed significant increase in liver enzymes($P < 0.001$) and total and direct bilirubin ($p < 0.001$, $p=0.006$ respectively), compared to normal control. Triphala 250mg, Triphala 500mg and Silymarin groups showed statistically significant decrease in liver enzymes and total bilirubin and direct bilirubin compared to hepatotoxic control ($p < 0.001$).There was no statistically significant difference in the total protein and albumin among groups. Histopathological evaluation of liver further conferred the hepatotprotective potential of Triphala. To conclude, Triphala at doses of 250mg/kg and 500mg/kg showed hepatoprotective effect in murine model of isoniazid and rifampicin induced hepatotoxicity.

Sushma, R., T. Sathe, A. Farias, P. Sanyal and S. Kiran (2017). "'Nature cures:' An alternative herbal formulation as a denture cleanser." Annals of African Medicine **16**(1): 6-12.

Background: Candida albicans is one of the microorganisms which harbor the oral cavity, especially in elderly. However, the incidence of existence of this increases in patients using removable dental prosthesis. There is therefore a need to test the anticandidal efficacy of these cost-effective, easily available products to be used as routine denture cleansers. Aim and Objectives: (1) To evaluate antifungal properties of triphala churna on the heat cure denture base material. (2) To evaluate the antifungal effect of chlorhexidine gluconate on the heat cure denture base material. (3) To compare the antifungal effect of triphala churna and chlorhexidine gluconate with a control. (4) To evaluate which among triphala churna and chlorhexidine gluconate has a better antifungal property on the heat cure denture base material. Materials and Methods: Study population consisted of sixty dentures wearers from those attending the Outpatient Department of Prosthodontics of the School of Dentistry, Krishna Institute of Medical Sciences Deemed University, Karad. Swabs were collected from the dentures before and after the use of triphala and chlorhexidine. The swabs were cultured on Sabouraud dextrose agar and the total Candida counts were determined. Conclusion: Triphala as an antifungal is shown to have more efficacy than the conventional chlorhexidine mouthwash. Résumé Arrière-plan: Candida albicans est l'un des micro-organismes qui abritent la cavité buccale surtout chez les personnes âgées. Cependant, l'incidence de l'existence de cette augmentation chez les patients utilisant des prothèses dentaires amovibles. Il est donc nécessaire de tester l'efficacité anticancédique de ces produits rentables et faciles à utiliser pour être utilisés comme nettoyants de routine pour prothèses dentaires. Buts et Objectifs: (1) Évaluer les propriétés antifongiques de Triphala churna sur le matériau de base de la prothèse thermo-durcissable. (2) Évaluer l'effet antifongique du gluconate de chlorhexidine sur le matériau de base de la prothèse thermo-durcissable. (3) Comparer l'effet antifongique de Triphala churna et du gluconate de chlorhexidine avec un témoin. (4) Évaluer lequel parmi Triphala churna et le gluconate de chlorhexidine a une meilleure propriété antifongique sur le matériel de base de la prothèse de durcissement à chaud. Matériaux et Méthode: La population de l'étude était constituée de soixante porteurs de prothèses dentaires de ceux qui fréquentaient le Département de Prosthodontie de l'École des Sciences Dentaires de l'Institut Krishna des Sciences Médicales de l'Université de Karad. Des prélèvements ont été effectués sur les prothèses avant et après l'utilisation de Triphala et de chlorhexidine. On a cultivé les écouvillons sur de l'agar Sabouraud dextrose et on a déterminé le nombre total de candida. Conclusion: Triphala comme un anti fongique est démontré pour avoir plus d'efficacité que le lavage de la bouche classique chlorhexidine.

Sutradhar, P., N. Debnath and M. Saha (2013). "Microwave-assisted rapid synthesis of alumina nanoparticles using tea, coffee and triphala extracts." Advances in Manufacturing **1**(4): 357-361.

Alumina nanoparticles (AlNP) were synthesized from aluminium nitrate using extracts of tea, coffee and triphala-a well known herbal plant as well as a non-toxic and eco-friendly green material. The synthesis was carried out taking 1:4 ratio of metal salt and these extracts under microwave irradiations at 540 W, which gave better yield of nanoparticles. Water was taken as solvent medium. The formations of AlNP were initially monitored by the colour changes occurring in the reaction mixture during the incubation period. As synthesized nanoparticles were characterized by scanning electron microscope (SEM), UV-Visible (UV-Vis) spectroscopy and Fourier transform infrared spectroscopy (FTIR). The AlNP were found to be spherical in shape in case of tea and coffee extracts with a size of 50-200 nm and to be oval shaped in case of triphala extract with an average size of 200-400 nm. The formation of AlNP with the microwave-assistance using these plant extracts has proved to be very faster than any other methods. In addition,

excellent reproducibility of these nanoparticles, without the use of any additional capping agent or stabilizer will have great advantages in comparison with microbial synthesis, avoiding all the tedious and hygienic complications.

Takauji, Y., K. Miki, J. Mita, M. N. Hossain, M. Yamauchi, M. Kioi, D. Ayusawa and M. Fujii (2016). "Triphala, a formulation of traditional Ayurvedic medicine, shows protective effect against X-radiation in HeLa cells." Journal of Biosciences: 1-7.

Ayurveda is a holistic medical system of traditional medicine, and Triphala is one of the most popular formulations in Ayurveda. Triphala is composed of three kinds of herb, Terminalia chebula, Terminalia bellirica, and Emblica officinalis. Since Triphala is shown to exhibit a protective activity against ionizing radiation in mice, we investigated its activity in HeLa cells. We found that Triphala showed the protective effects against X-radiation and bleomycin, both of which generate DNA strand breaks, in HeLa cells. Further, Triphala efficiently eliminated reactive oxygen species (ROS) in HeLa cells. Thus, the antioxidant activity of Triphala would likely play a role in its protective actions against X-radiation and bleomycin because both agents damage DNA through the generation of ROS. These observations suggested that the radioprotective activity of Triphala can be, at least partly, studied with the cells cultured in vitro. The simple bioassay system with human cultured cells would facilitate the understanding of the molecular basis for the beneficial effects of Triphala.

Tambekar, D. H. and S. B. Dahikar (2011). "Antibacterial activity of some Indian ayurvedic preparations against enteric bacterial pathogens." Journal of Advanced Pharmaceutical Technology and Research **2**(1): 24-29.

In Ayurveda, various herbal preparations are clinically used to prevent or cure infectious diseases. Herbal preparations such as Triphala churna, Hareetaki churna, Dashmula churna, Manjistadi churna, Sukhsarak churna, Ajmodadi churna, Shivkshar pachan churna, Mahasudarshan churna, Swadist Virechan churna and Pipramool churna were investigated by preparing their organic solvent extract for antibacterial potential against enteric bacterial pathogens such as Escherichia coli, Staphylococcus aureus, Enterobacter aerogenes, Pseudomonas aeruginosa, Bacillus subtilis, Klebsiella pneumoniae, Salmonella typhi, Staphylococcus epidermidis, Salmonella typhimurium and Proteus vulgaris, respectively. In the present study, Triphala churna, Hareetaki churna, Dashmula churna were potent antibacterial agents against S. epidermidis, P. vulgaris, S. aureus, E. coli, P. aeruginosa and S. typhi. The study supports the use of these herbal preparations not only as dietary supplements but also as agents to prevent or control enteric bacterial infections.

Tandon, S., K. Gupta, S. Rao and K. Malagi (2010). "Effect of Triphala mouthwash on the caries status." International Journal of Ayurveda Research **1**(2): 93–99.

Nearly 60–70% of the child Indian population suffers from dental caries. Mouth rinsing is the most cost effective method of preventing dental caries. 'Triphala' has been a classic Ayurveda remedy, probably the best known among all Ayurvedic compounds. This study was conducted on 1501 students in the age group of 8-12 years with the aim of determining the effect of Triphala mouthwash on prevention of dental caries (manifest caries) as well as incipient carious lesions, and also comparing the effect of Triphala and chlorhexidine mouthwashes. The incipient caries was recorded at 3, 6, 9 months intervals and manifest caries at 9 months interval. No significant increase in the DMFS scores was found at the end of 9 months. Also, there was no significant increase in the incipient caries score towards the conclusion of the study. It was concluded that there was no significant difference between the Triphala and the chlorhexidine mouthwashes.

Tarasiuk, A., P. Mosińska and J. Fichna (2018). "Triphala: Current applications and new perspectives on the treatment of functional gastrointestinal disorders." Chinese Medicine (United Kingdom) **13**(1).

Background: Ayurvedic medicine is based on natural healing methods that use herbal medicine to cleanse the body of toxins and to attain physical and mental regeneration. Triphala (TLP) is one of the most important ayurvedic supplements and is believed to have a beneficial effect on the entire gastrointestinal (GI) tract. Purpose: We aim to summarize available literature focused on the components of TLP (Terminalia chebula, Terminalia bellerica and Phyllanthus emblica) and discusse their effectiveness and therapeutic value for improving lower GI symptoms in functional GI disorders, particularly irritable bowel syndrome (IBS). Methods: This study is based on pertinent papers that were retrieved by a selective search using relevant keywords in PubMed and ScienceDirect databases. Results: The components of TLP are believed to cause restoration of the epithelium lining of the digestive tract, and by exhibiting mild laxative properties facilitate passage of stool in the colon. TLP is rich in polyphenols, vitamin C and flavonoids,

which provide antioxidant and anti-inflammatory effects. It also contains various types of acids, such as gallic, chebulagic and chebulinic, which additionally possess cytoprotective and antifungal properties. Conclusion: Triphala holds potential in improving lower GI symptoms and may be a valuable and effective addition to standard treatment of IBS. Supplementation of TLP herbal formulations alone or along with other probiotics can be recommended in ongoing clinical studies.

Tatke, P. A., I. S. R. Nidhiya and S. G. Deshpande (2010). "Repeated dose oral toxicity study of an antidiabetic polyherbal formulatio (Diapal tablets) in rats." Pharmacologyonline **1**: 933-942.

Diapal, a polyherbal antidiabetic tablet formulation, was evaluated for its safety at the therapeutic dose level by repeated dose oral toxicity study in rats. Diapal tablets contain ingredients of herbal origin viz, Neem, Turmeric, Fenugreek, Arjun, Triphala etc. The herbal formulation was administered orally to rats at the therapeutic dose of 250 mg/kg/day for 90 days. All animals were monitored daily for their health status for signs of abnormalities. The body weight, water consumption and food intake of the rats were measured once weekly. At the end of the study period, various hematological, biochemical parameters were measured and histopathological examination of selected organs were conducted. The study resulted from long term oral administration of herbal formulation (250 mg/kg) did not cause any relevance of serious signs and significant changes in physical, hematological and biochemical parameters as compared with control. Moreover, no pathological features were identified in treated group as monitored by histopathological analysis of the internal organs. The study established that Diapal tablets at the dose given in the present study did not induce any remarkable toxic effects and it is safer in the rats following oral administration for 90 consecutive days.

Thomas, B., S. Y. Shetty, A. Vasudeva and V. Shetty (2011). "Comparative evaluation of Antimicrobial Activity of Triphala and commercially available Toothpastes: An in-vitro study." International Journal of Public Health Dentistry **2**(1): 8-12.

Background. Triphala is an ayurvedic herbal formulation consisting of the dried fruits of three medicinal plants Terminalia chebula, Terminalia belerica and Phyllanthus embelica, which is used for conditions like headache, constipation, liver conditions and it possess anti-inflammatory, analgesic, anti-aging properties.Aim. The present study was undertaken to assess the antimicrobial properties of Triphala in comparison with commercially available toothpastes.Materials and Methods. The standard stock culture of Streptococcus mutans strain from Microbial type culture collection (MTCC), Chandigarh and clinical culture of Streptococcus mutans isolated from the plaque samples of the patients were used. The antimicrobial activity of ethanol extracts of Triphala and commercially available toothpastes (Product 1and Product 2) against MTCC strain and clinical isolate of Streptococcus mutans was evaluated using agar gel diffusion method. Further, Minimum Inhibitory Concentration (MIC)/Minimum Bactericidal Concentration (MBC) values were obtained using broth dilution method.Statistical analysis. The collected data were statistically analyzed by one-way analysis of variance (ANOVA) to evaluate the differences. The threshold for the statistical significance was set at $P<0.05$.Results. The present study showed that Triphala has significant antimicrobial activity when compared to commercially available Product 1 and Product 2 toothpaste ($P<0.05$). Conclusions. Triphala has significant antimicrobial activity and thus can be employed as an effective anti-plaque agent and can be used in the prevention of dental caries. Since Triphala is of herbal nature, it can be easily extracted and is cost effective.

Tiwari, A. K. (2008). "Invigorated barley in diabetes." Current Science **95**(1): 25-29.

With over 41 million diabetics, India has become diabetes-capital of the world. The country is also a leader in the prevalence of metabolic syndrome and obesity, with hypertension to join the list soon. Historical evidences suggest that the ancient Indian physicians were able to stabilize diabetes, obesity and related metabolic syndrome effectively through recommendations, which are not different from those given today to patients, like weight management, suitable diet and exercise. Dietary management in diabetes has always been amongst the key strategies. Some 2800 years ago, the ancient Hindu physician, Charaka had identified barley as a low glycemic-dietary substitute for diabetes patients. He also advocated different invigorating agents like honey, triphala and vinegar for use with barley-based diet and drink. This article presents scientific evidence for the genuineness of selection of barley as a dietary substitute and inclusion of other fortifying agents in barley-based diet and drink.

Tsering, J. and X. Hu (2018). "Triphala Suppresses Growth and Migration of Human Gastric Carcinoma Cells in Vitro and in a Zebrafish Xenograft Model." BioMed Research International **2018**.

Objectives. Triphala is an extensively prescribed traditional medicinal formula with potential therapeutic effects on various malignancies such as breast, colon, pancreas, prostate, ovarian, cervical, endometrial, and lymphatic cancer as well as melanoma. This study aimed to investigate Triphala for antitumor activities against gastric cancers. Methods. In vitro tumor growth and migration of human gastric cancer cells were examined using the CCK-8 and Transwell assays, respectively. In vivo tumor progression was studied in a zebrafish xenograft model. The anticancer activity of Triphala was quantified as growth and metastasis inhibition rate. The underlying molecular mechanism was investigated by Western blotting. Results. The CCK-8 and Transwell experiments indicated that Triphala significantly decreased tumor proliferation and suppressed cell migration in vitro. The zebrafish xenograft study revealed that administration of Triphala inhibited the xenograft growth and metastasis of transplanted carcinoma cells in vivo. Western blotting analysis demonstrated an inhibition of phosphorylation of EGFR, Akt, and ERK in the presence of Triphala, indicating that its antineoplastic mechanism is associated with the regulation of the EGFR/Akt/ERK signaling cascade. Conclusion. Triphala is a promising antineoplastic agent for the treatment of gastric carcinomas with significant antiproliferative and antimetastatic activities.

Udhaya Lavinya, B., U. R. Aline, W. Wimethune, M. N. Jha and E. P. Sabina (2015). "Anti-Hyperglycaemic potential of triphala onstreptozotocininduced diabetes in rats." International Journal of Pharmacy and Technology **6**(4): 7951-7957.

Present study was undertaken to evaluate the anti-hyperglycaemic potential of the herbal formulation Triphala in diabetic rat models. Diabetes was induced by a single intra-peritoneal injection of streptozotocin(50 mg/kg b.w.) in the experimental animals. The diabetic rats were orally administered with Triphala, once a dayfor 30 days at a dosage of 500 mg/kg b.w. and the efficacy of the same was compared with that of the Glibenclamide (600 µg/kg b.w.) treated diabetic rats. The estimation of biochemical parameters were carried out in the experimental animals and compared with that of the normal rats. It was found that Triphala-treated rats showed significant decrease in the levels of blood glucose, serum liver and kidney function markers. There was significant increase in serum total protein and albumin levels and also oral glucose tolerance on treatment with Triphala. Our results indicate that Triphala possesses anti-hyperglycaemic activity in streptozotocin-induced diabetes in Wistar albino rats. © 2015, International Journal Of Pharmacy and Technology.

Umarji, M. P. and G. S. Jyothi (2013). "Evaluation of efficacy and safety of a herbal formulation EveCare in the management of menstrual irregularities: Meta-analysis of 8 clinical studies." International Journal of Science and Research **4**(6): 475-481.

EveCare capsule is a polyherbal formulation that comprises extracts of Saraca indica, Boerhaavia diffusa, Symplocos racemosa, Tinospora cordifolia, Solanum nigrum, Aspargus racemosus, Aloe vera, Santalum album, Cyperus rotundus, Adhatoda vasica, Triphala, Dashamoola, Trikatu, and Bombax malabaricum; and powders of Kasisa, Godanti bhasma and Yashada bhasma. The aim was to carry out the meta-analysis of 8 clinical trials for evaluating the efficacy and safety of menstrual irregularities. This is a meta-analysis of 8 clinical trials on Evecare in various menstrual irregularities. Inclusion criteria: Clinical studies, which evaluated the role of Evecare in various menstrual irregularities, were included in the meta-analysis. The outcome variables included measurement data on changes in clinical symptoms and signs, laboratory results, and incidence of adverse events during/after treatment. Exclusion criteria: Experimental, Phase I and Phase II clinical studies were excluded from the meta-analysis. Study procedure: The list of 08 clinical studies included for the meta-anlaysis is provided in Table 1. From each study, the demographic data of patients on entry was tabulated Table 2. The duration of treatment varied from 2 -3 months and in most of the studies, Evecare was given at a dose of 1-2 capsules twice daily or Evecare Syrup-10-15 ml twice daily. Summary and conclusion: Present Meta -analysis of clinical studies indicate safety and efficacy of Evecare in normalizing menstrual irregularities, along with reduction in excessive menstrual bleeding and normalization of character and duration of menstrual flow. Improvement in anemia and altered hormonal levels was also noted in clinical studies.

Upadhyay, A., P. Agrahari and D. K. Singh (2014). "A review on the pharmacological aspects of Terminalia chebula." International Journal of Pharmacology **10**(6): 289-298.

Terminalia chebula Retz. (Combretaceae) is called the “King of medicines” in Tibet and is always listed first in the Ayurvedic materia medica because of its extraordinary powers of healing with a wide spectrum of biological activity. A number of chemical constituents have been isolated from the plant extract that include chebulin, ellagic acid, 2,4-chebulyl-D-glucopyranose, arjunglucoside I, arjungenin, chebulinic acid, gallic acid, ethyl gallate, punicalagin, terflavin A, terchebin, luteolin and tannic acid. The plant is an

important constituent of an herbal formulation, contains the name TRIPHALA which is veiy popular traditional medicine for chronic disorder like diabetes, nervine disorder and epilepsy. The plant has been reported to possess various pleiotropic effects such as antioxidant, antidiabetic, renoprotective, hepatoprotective, immunomodulator and prokinetic effect. The study elucidates about various pharmacological effects exhibited by this multipurpose tree.

Vadde, R., S. Radhakrishnan, L. Reddivari and J. K. P. Vanamala (2015). "Triphala Extract Suppresses Proliferation and Induces Apoptosis in Human Colon Cancer Stem Cells via Suppressing c-Myc/Cyclin D1 and Elevation of Bax/Bcl-2 Ratio." BioMed Research International **2015** Article ID 649263, 12 pages.

Colon cancer is the second leading cause of cancer related deaths in the USA. Cancer stem cells (CSCs) have the ability to drive continued expansion of the population of malignant cells. Therefore, strategies that target CSCs could be effective against colon cancer and in reducing the risk of relapse and metastasis. In this study, we evaluated the antiproliferative and proapoptotic effects of triphala, a widely used formulation in Indian traditional medicine, on HCT116 colon cancer cells and human colon cancer stem cells (HCCSCs). The total phenolic content, antioxidant activity, and phytochemical composition (LC-MS-MS) of methanol extract of triphala (MET) were also measured. We observed that MET contains a variety of phenolics including naringin, quercetin, homoorientin, and isorhamnetin. MET suppressed proliferation independent of p53 status in HCT116 and in HCCSCs. MET also induced p53-independent apoptosis in HCCSCs as indicated by elevated levels of cleaved PARP. Western blotting data suggested that MET suppressed protein levels of c-Myc and cyclin D1, key proteins involved in proliferation, and induced apoptosis through elevation of Bax/Bcl-2 ratio. Furthermore, MET inhibited HCCSCs colony formation, a measure of CSCs self-renewal ability. Anticancer effects of triphala observed in our study warrant future studies to determine its efficacy in vivo.

Vani, T., M. Rajani, S. Sarkar and C. J. Shishoo (1997). "Antioxidant properties of the ayurvedic formulation triphala and its constituents." International Journal of Pharmacognosy **35**(5): 313-317.

The in vitro antioxidant potential of Triphala and its constituents was tested with the following systems: radical scavenging activity measured by DPPH reduction, and superoxide radical and peroxy radical scavenging properties measured by riboflavin/light/NBT reduction and linoleic acid peroxidation, respectively. Alcohol extracts of Triphala and its constituents were studied comparatively and found to be strong antioxidants. Triphala was also effective in preventing superoxide-induced haemolysis of red blood cells. The extracts also prevented lipid peroxidation induced by Fe3+/ADP/Ascorbate system in rat liver mitochondria. The major phenolic compounds of the alcohol extracts were confirmed as tannins.

Varma, S. R., T. O. Sivaprakasam, A. Mishra, L. M. S. Kumar, N. S. Prakash, S. Prabhu and S. Ramakrishnan (2016). "Protective effects of triphala on dermal fibroblasts and human keratinocytes." PLoS ONE **11**(1).

Human skin is body's vital organ constantly exposed to abiotic oxidative stress. This can have deleterious effects on skin such as darkening, skin damage, and aging. Plantderived products having skin-protective effects are well-known traditionally. Triphala, a formulation of three fruit products, is one of the most important rasayana drugs used in Ayurveda. Several skin care products based on Triphala are available that claim its protective effects on facial skin. However, the skin protective effects of Triphala extract (TE) and its mechanistic action on skin cells have not been elucidated in vitro. Gallic acid, ellagic acid, and chebulinic acid were deduced by LC-MS as the major constituents of TE. The identified key compounds were docked with skin-related proteins to predict their binding affinity. The IC50 values for TE on human dermal fibroblasts (HDF) and human keratinocytes (HaCaT) were 204.90 ± 7.6 and 239.13 ± 4.3 μg/mL respectively. The antioxidant capacity of TE was 481.33 ± 1.5 mM Trolox equivalents in HaCaT cells. Triphala extract inhibited hydrogen peroxide (H2O2) induced RBC haemolysis (IC50 64.95 μg/mL), nitric oxide production by 48.62 ± 2.2%, and showed high reducing power activity. TE also rescued HDF from H2O2-induced damage; inhibited H2O2 induced cellular senescence and protected HDF from DNA damage. TE increased collagen-I, involucrin and filaggrin synthesis by 70.72 ± 2.3%, 67.61 ± 2.1% and 51.91 ± 3.5% in HDF or HaCaT cells respectively. TE also exhibited anti-tyrosinase and melanin inhibition properties in a dosedependent manner. TE increased the mRNA expression of collagen-I, elastin, superoxide dismutase (SOD-2), aquaporin-3 (AQP-3), filaggrin, involucrin, transglutaminase in HDF or HaCaT cells, and decreased the mRNA levels of tyrosinase in B16F10 cells. Thus, Triphala exhibits protective benefits on skin cells in vitro and can be used as a potential ingredient in skin care formulations.

Varshney, S., P. Varshney, S. K. Dash, M. K. Gupta, A. Kumar, B. Bist and A. Sharma (2012). "Antibacterial activity of fruits of Terminalia chebula and Terminalia belerica against mastitis field isolates." Medicinal Plants **4**(3): 167-169.

Mastitis is the most damaging disease of dairy industry worldwide. The aim of the present study was to evaluate the antibacterial effects of hot aqueous extract (HAE) of the fruits of Terminalia chebula and Terminalia belerica on field isolates of mastitis. Hot aqueous extract of the fruits of the selected plants as well as a mixture (1:1) of these two extracts were used for their synergistic/antagonistic effect. Their antibacterial potential against all the bacterial isolates was determined by disc diffusion method. The zones of inhibition with the mixture of two extracts revealed no synergistic or antagonistic effect. The decrease in the zone of inhibition after a period of 24h proved the effect as bacteriostatic rather than bactericidal. The findings justify the use of Triphala as a compound or Harad (Terminalia chebula) and Bahera (Terminalia belerica) separately to treat the cases of bovine clinical/ sub-clinical mastitis. A dose of 20 mg was considered as effective for the treatment of the cases of mastitis.

Vazirian, M., M. Khanavi, Y. Amanzadeh and H. Hajimehdipoor (2011). "Quantification of gallic acid in fruits of three medicinal plants." Iranian Journal of Pharmaceutical Research **10**(2): 233-236.

Triphala is a traditional herbal formulation consisting of dried fruits originating from three medicinal plants, namely Terminalia chebula, Terminalia bellerica and Phyllanthus emblica. It is used in folk medicine for the treatment of headaches, dyspepsia and leucorrhoea. There are some reports regarding Triphala's pharmacological effects including its anti-cancer, radioprotective, hypocholesterolaemic, hepatoprotective and anti-oxidant activities. The most important components of these plants are the tannins and gallic acid which they contain. Gallic acid being a compound with tannin structure existing in the Triphala fruit. In this research, the gallic acid content contained in the three plants constituting Triphala was determined. Plant fruits were purchased from available Iranian markets. Milled and powdered fruits from each plant were extracted with 70% acetone and subjected to a reaction with rhodanine reagent in the process forming a colored complex. The complex's absorbance was measured at 520 nm and the amount of gallic acid was determined using its calibration curve. According to the results, the highest amount of gallic acid was observed in Phyllanthus embelica (1.79-2.18%) and the lowest amount was found in Terminalia chebula (0.28-0.80%). Moreover, differences between plant samples from different markets places were found to be statistically significant ($p < 0.05$). These differences can possibly be due to the source of plant preparation, storage condition and period of Triphala storage. In general, the rhodanine assay is a simple, rapid and reproducible method for the standardization of Triphala as gallic acid.

Venkateswarlu, G., S. Ganapaty and A. M. S. Sudhakar (2019). "Preparation of Triphala churna using the ingredients obtained from local market and comparative standardization." Pharmacognosy Journal **11**(1): 102-111.

Introduction: In the recent years there has been rapid growth in the field of herbal medicine most of the tradition systems of medicine are accepted universally after standardization only. it very important to develop an essential techniques to standardization of herbal related drugs. The present study standardization of Triphala Churna majorly focused on that area under WHO guidelines. Methods: This polyherbal Churna used treat the constipation and other gastric disorders. In this study a prepared Thriphala Churna was comparatively standardized with the reference obtained from market. For the standardization of the above formulations were done by evaluating the macroscopical, microscopical, powder flow properties, extractive values, Physicochemical characters, heavy metal content detection, qualitative and quantitive determination of tannins and alkaloids, TLC finger print, in-vitro anti-oxidant activity and cytotoxic activity to assess the quality and safety and therapeutic activity of formulation. Results: The above parameters for the both formulation complies with the strands. The flow properties are poor. From the preliminary phytochemical test revealed the presence of various bioactive constituents. Majorly the concentration of tannins and flavonoids are high in water extract and also the water extract having the good anti-oxidant and in vitro cytotoxic activity. Hence the Triphala extracts may be used for various Ayurvedic preparations to chronic diseases like cancer.

Venkateswarlu, G., S. Ganapaty and A. M. S. Sudhakar (2019). "Preparation of Triphala churna using the ingredients obtained from local market and comparative standardization." Pharmacognosy Journal **11**(1): 102-111.

Introduction: In the recent years there has been rapid growth in the field of herbal medicine most of the tradition systems of medicine are accepted universally after standardization only. it very important to develop an essential techniques to standardization of herbal related drugs. The present study standardization of Triphala Churna majorly focused on that area under WHO guidelines. Methods: This

polyherbal Churna used treat the constipation and other gastric disorders. In this study a prepared Thriphala Churna was comparatively standardized with the reference obtained from market. For the standardization of the above formulations were done by evaluating the macroscopical, microscopical, powder flow properties, extractive values, Physicochemical characters, heavy metal content detection, qualitative and quantitive determination of tannins and alkaloids, TLC finger print, in-vitro anti-oxidant activity and cytotoxic activity to assess the quality and safety and therapeutic activity of formulation. Results: The above parameters for the both formulation complies with the strands. The flow properties are poor. From the preliminary phytochemical test revealed the presence of various bioactive constituents. Majorly the concentration of tannins and flavonoids are high in water extract and also the water extract having the good anti-oxidant and in vitro cytotoxic activity. Hence the Triphala extracts may be used for various Ayurvedic preparations to chronic diseases like cancer.

Vidhya Rekha, U., M. Anita, J. Bhuvaneswarri, G. Jayamathi, K. Sadhana, V. Ramya, P. Paddmanabhan and J. Selvaraj (2019). "Free radical scavenging potentials of Triphala: A medicinal herb used in Indian Ayurvedic system of medicine." Drug Invention Today **12**(3): 407-411.

Background: Triphala is a commonly used Indian Ayurvedic formula made of the dried powder of three different fruits: Hence, its name: Tri (Three) and phala (Fruit). Amla (Emblica officinalis), Haritaki (Terminalia chebula), and Bibhitaki (Terminalia bellirica) are mixed in equal parts to make a proper Triphala. Aim: The study was designed to assess the effects of Triphala churna on the free radical scavenging activities such as hydrogen peroxide, nitric oxide (NO) radical, and superoxide anion radical scavenging activities in vitro. Results: The Triphala churna showed potent free radical scavenging activity in concentration-dependent manner. It exhibited potent H2O2 scavenging property, and the IC50 was found to be 0.06 Mcg/ml, and for the standard drug, Vitamin C was 0.06 Mcg/ml. NO scavenging property of Triphala was found to be 0.06 Mcg/ml and for Vitamin C 0.09 Mcg/ml and superoxide anion of Vitamin C was found to be 0.053 Mcg/ml and 0.053 Mcg/ml, respectively. Conclusion: The study concluded that Triphala as a whole is to be expected to be more effective due to the combined activity of the individual components. Hence, it is concluded that Triphala may provide effective complementary or alternative treatment regimens for patients with suffering from health ailments.

Vinothini, D. S. and L. Thangavelu (2013). "Nature's gift for management of irritable bowel syndrome." Pharma Research **10**(1): 6-10.

Irritable Bowel Syndrome is a chronic gastro-intestinal disorder characterized by abdominal pain and change of bowel habits without organic diseases. The most common drugs antibiotics, probiotics, antispasmodic and antidepressant. The two types of anti-depressant drugs are TCA and SSIRs, other than synthetic drug some herbal medicines are also used for IBS. Hence an attempt was taken to review the literature based on the treatment strategies of irritable bowel syndrome. Herbal drugs reviewed here include, Peppermint oil, Chamomile, Aloe vera, Slippery elm, Triphala, Curcumin.

Vyas, J., P. Itankar, M. Tauqeer, A. Kelkar and M. Agrawal (2013). "Development of HPTLC method for estimation of piperine, guggulsterone e and Z in polyherbal formulation." Pharmacognosy Journal **5**(6): 259-264.

Aim: Triphala guggul a polyherbal tablet formulation is used for sinusitis, allergies, boils, constipation, piles, high cholesterol, rheumatism, mal-absorption, purgative and as blood purifier. In the present study an attempt has been made to develop a simple, precise, rapid and cost-effective high performance thin-layer chromatographic (HPTLC) method for quantitative estimation of piperine, guggulsterone E and Z in Triphala guggul formulation. Method: The different batches of formulation were prepared in laboratory by using authenticated raw material and were subjected to various physical and chemical evaluations. Then the prepared formulation and three commercial formulations were investigated for the qualitative and quantitative estimation of mentioned constituents. The methanolic extract of all formulations were quantified by using HPTLC studies. Linear regression data for the calibration curves of standards viz. piperine, guggulsterone E and Z showed a good linear relationship over a concentration range of 0.06-0.14 µg/spot, 2.5-17.5 µg/spot, 5-30 µg/spot respectively with the correlation coefficient of 0.99085, 0.99847, 0.9990 respectively and thus exhibits good linearity between concentration and area. The content of guggulsterone E (14.68 %w/w, 13.05 %w/w, 6.36 %w/w, 14.36 %w/w); guggulsterone Z (31.81 %w/w, 26.95 %w/w, 11.62 %w/w, 23.86 %w/w); and piperine (0.068 %w/w, 0.0150 %w/w, 0.321 %w/w, 0.0375 %w/w) were found in TF, TN, TM, TP prepared and three marketed formulation respectively. Conclusion: The proposed HPTLC method was found to be rapid, simple and linear for quantitative estimation of piperine, guggulsterone E & Z in different formulations and extracts.

Wang, M., Y. Li and X. Hu (2018). "Chebulinic acid derived from triphala is a promising antitumour agent in human colorectal carcinoma cell lines." BMC Complementary and Alternative Medicine **18**(1): 342.

BACKGROUND: Triphala is an Ayurvedic rasayana formulation reputed for its antitumour activities, and chebulinic acid and chebulagic acid, along with other phenolic acids, have been proposed to be responsible for its effects. METHODS: In this study, the anti-proliferative activities of these agents were evaluated in colorectal carcinoma cell lines with three phenotypes exposed to several batches of triphala samples with different quantities of chebulinic acid and chebulagic acid. The pro-apoptotic and anti-migratory activities and the probable antitumour mechanisms of the more potent anti-proliferative phytochemical were also investigated. RESULTS: The results demonstrated that chebulinic acid, which exerts potent anti-proliferative, pro-apoptotic and anti-migratory effects, is a key molecule for maintaining the antitumour efficacy of triphala. The antitumour mechanism of chebulinic acid is probably related to the PI3K/AKT and MAPK/ERK pathways. CONCLUSIONS: Chebulinic acid is not only a critical component of the anticancer activities of triphala but also a promising natural multi-target antitumour agent with therapeutic potential.

Wang, W., T. Liu, L. Yang, Y. Ma, F. Dou, L. Shi, A. Wen and Y. Ding (2019). "Study on the multi-targets mechanism of triphala on cardio-cerebral vascular diseases based on network pharmacology." Biomedicine and Pharmacotherapy **116**.

Background & aims: Numerous references made clear that Triphala is revered as a multiuse therapeutic and perhaps even panacea historically. Nevertheless, the protective mechanism of Triphala on cardio-cerebral vascular diseases (CCVDs) remains not comprehensive understanding. Hence, a network pharmacology-based method was suggested in this study to address this problem. Methods: This study was based on network pharmacology and bioinformatics analysis. Information on compounds in herbal medicines of Triphala formula was acquired from public databases. Oral bioavailability as well as drug-likeness were screened by using absorption, distribution, metabolism, and excretion (ADME) criteria. Then, components of Triphala, candidate targets of each component and known therapeutic targets of CCVDs were collected. Compound-target gene and compounds−CCVDs target networks were created through network pharmacology data sources. In addition, key targets and pathway enrichment were analyzed by STRING database and DAVID database. Moreover, we verified three of the key targets (PTGS2, MMP9 and IL6) predicted by using western blot analysis. Results: Network analysis determined 132 compounds in three herbal medicines that were subjected to ADME screening, and 23 compounds as well as 65 genes formed the principal pathways linked to CCVDs. And 10 compounds, which actually linked to more than three genes, are determined as crucial chemicals. Core genes in this network were IL6, TNF, VEGFA, PTGS2, CXCL8, TP53, CCL2, IL10, MMP9 and SERPINE1. And pathways in cancer, TNF signaling pathway, neuroactive ligand-receptor interaction, etc. related to CCVDs were identified. In vitro experiments, the results indicated that compared with the control group (no treatment), PTGS2, MMP9 and IL6 were up-regulated by treatment of 10 ng/mL TNF-α, while pretreatment with 20–80 μg/mL Triphala could significantly inhibit the expression of PTGS2, MMP9 and IL6. With increasing Triphala concentration, the expression of PTGS2, MMP9 and IL6 decreased. Conclusions: This study revealed the complex components and pharmacological mechanism of Triphala, and obtained some potential therapeutic targets of CCVDs, which could provide theoretical basis for the research and development of new drugs for treating CCVDs.

Westfall, S., N. Lomis and S. Prakash (2018). "A novel polyphenolic prebiotic and probiotic formulation have synergistic effects on the gut microbiota influencing Drosophila melanogaster physiology." Artificial Cells, Nanomedicine and Biotechnology: 1-15.

The gut microbiota is a vast community of synergistic bacterial species providing health benefits to the host. Imbalances in the gut microbiota (dysbiosis) due to diet, antibiotic use, age and stress contribute to disease development including diabetes, obesity, colon cancer, inflammatory bowel disease, inflammaging and neurodegeneration. Fortunately, a probiotic regime with a diet rich in prebiotics may reverse dysbiosis promoting health and wellness in age. The current study designs, optimizes and tests a novel probiotic and synbiotic formulation consisting of three metabolically active probiotics Lactobacillus plantarum, Lactobacillus fermentum and Bifidobacteria infantis together with a novel polyphenol-rich prebiotic, Triphala. The prebiotic action of Triphala was characterized using in vitro batch cultures, Drosophila melanogaster and a simulated model of the human gastrointestinal tract (SHIME) where in each model, Triphala supported growth of beneficial bacteria while inhibiting pathogenic species. Neither Triphala at 0.5% w/v nor the individual probiotics at 5.0 × 108 to 7.5 × 109 CFU/ml demonstrated toxicity in Drosophila. Interestingly, motility was combinatorially enhanced by the probiotic and synbiotic formulations reflecting the beneficial variations in the gut microbiota. Altogether, the present study shows

that probiotics and synbiotics in combination are more effective at modulating the gut microbiota and eliciting biological effects than their components.

Westfall, S., N. Lomis and S. Prakash (2018). "A polyphenol-rich prebiotic in combination with a novel probiotic formulation alleviates markers of obesity and diabetes in Drosophila." Journal of Functional Foods **48**: 374-386.

Imbalances in the gut microbiota are directly associated with the pathogenesis of diabetes and obesity. The current study investigates how the combination of three probiotics Lactobacillus plantarum NCIMB 8826, L. fermentum NCIMB 5221 and Bifidobacteria longum subsp. infantis NCIMB 702255 with a novel polyphenol-rich prebiotic Triphala has combinatorial benefits on the symptoms and underlying mechanisms of diet-induced diabetes and obesity. Drosophila melanogaster fed either a high-fat (HFD) or high-sugar diet (HSD) were pretreated with individual or combined probiotic and/or prebiotic therapy. The individual probiotics elicited some beneficial effects on the physiological markers of diabetes and obesity including reductions in total weight, glucose and triglyceride levels with Lp8826 having a higher efficacy against HSD and Bi702255 against HFD stresses; however, a combinatorial effect was observed with the probiotic and synbiotic formulations. Further, the synbiotic formulation consistently rescued variations in insulin resistance and lipogenesis outlining the synbiotic's potential for treating metabolic disorders.

Wiwanitkit, V. (2011). "Anticataract potential of triphala." Journal of Ayurveda and Integrative Medicine **2**(2): 51.

Wongnoppavich, A., K. Jaijoi and S. Sireeratawong (2009). "Triphala: The Thai traditional herbal formulation for cancer treatment." Songklanakarin Journal of Science and Technology **31**(2): 139-149.

Nowadays, Thai herbal plants are widely accepted in alternative medicine for treatment patients suffering deleterious diseases such as cancer. Having a variety of indications, several herbal formulas including Triphala have been routinely used as health tonic in Thai traditional and Ayurvedic medicines. The formulation of Triphala is a mixture of fruits of three plants: Phyllanthus emblica Linn., Terminalia chebula Retz. and Terminalia bellerica (Gaertn.) Roxb., all of which were reported to inhibit the growth and induce the death of cancer cells effectively. Therefore, anticancer activities inevitably turn out to be one of the essential properties of Triphala formula as well. It is likely that a number of active compounds in the formula, especially tannins, are the key agents that induce the apoptotic cell death via free radical production in cancer cells. On the other hand, all three fruits of these plants also contain high levels of antioxidants, capable of protecting normal cells from any free radical-mediated injuries effectively. Thus, the paradoxical role of Triphala is cell-type specific and becomes an advantage for usage of this formulation. Furthermore, Triphala has high potentials for inhibition and prevention of mutagenesis and metastasis of cancer cells. Finally, studies in the mechanism of action of Triphala and the product development as well as safety evaluation of the standard herbal extract are definitely required for future pharmacological applications of Triphala as anticancer agents for cancer therapy.

Yang, M. H., Y. Vasquez, Z. Ali, I. A. Khan and S. I. Khan (2013). "Constituents from Terminalia species increase PPARα and PPARγ levels and stimulate glucose uptake without enhancing adipocyte differentiation." Journal of Ethnopharmacology **149**(2): 490-498.

Ethnopharmacological relevance The fruits of Terminalia bellerica Roxb. (Combretaceae) and T. chebula Retz. (Combretaceae) are important components of triphala, a popular Ayurvedic formulation, for treating diabetes in Indian traditional medicine. Aim of the study The aim of this study was to evaluate the effects of the constituents of T. bellerica and T. chebula fruit extracts on PPARα and PPARγ signaling/expression, cellular glucose uptake and adipogenesis. Materials and methods PPARα and PPARγ signaling and expression (luciferase assay and western blot) and the insulin-stimulated uptake of 2-NBDG were determined in HepG2 cells. The effects on adipogenesis were determined in 3T3-L1 cells by Oil red O staining and measurement of lipid content by AdipoRed reagent. Results Out of the 20 compounds, two ellagitannins, chebulagic acid (1) and corilagin (2), and three gallotannins, 2,3,6-tri-O-galloyl-β-d-glucose (3), 1,2,3,6-tetra-O-galloyl-β-d- glucose (4), and 1,2,3,4,6-penta-O-galloyl-β-d-glucose (5), showed the enhancement of PPARα and/or PPARγ signaling. Two of the gallotannins (4 and 5) also increased PPARα and PPARγ protein expression, while all three (3-5) enhanced insulin-stimulated glucose uptake into HepG2 cells. Compound 1,2,3,6-tetra-O-galloyl-β-d-glucose (4) was the most potent in increasing cellular glucose uptake (9.92-fold increase at 50 μM). In the test for adipogenesis, 3-5 did not enhance the differentiation of 3T3-L1 preadipocytes but inhibited the adipogenic effect of rosiglitazone. Conclusion Three gallotannins (3-5) from Terminalia fruits acting as enhancers of both PPARα and PPARγ signaling increased insulin-stimulated glucose uptake without inducing the adipogenesis, with 1,2,3,6-tetra-O-

galloyl-β-d- glucose (4) being the most effective in stimulating glucose uptake and 1,2,3,4,6-penta-O-galloyl-β-d-glucose (5) being most effective in increasing PPAR protein expression.

Yoon, W. S., C. Y. Kim, D. S. Yang, Y. J. Park, W. Park, Y. C. Ahn, S. H. Kim and G. Y. Kwon (2012). "Protective effect of triphala on radiation induced acute intestinal mucosal damage in sprague dawley rats." Indian Journal of Experimental Biology **50**(3): 195-200.

Aim of the study was to determine protective effect of triphala on radiation-induced rectal mucosal damage. Male Sprague Dawley rats (30) were divided into 5 groups. Rats in group A were sham irradiated and rats in group B underwent only irradiation. Rats in group C were administered triphala 1g/kg/day orally for 5 consecutive days before irradiation. Rats in group D and E were administered triphala 1 and 1.5 g/kg/day orally for 10 consecutive days, respectively. Rectal mucosal damage was induced by a single fraction of 12.5Gy gamma irradiation (Ir-192) on 5 th day. All the rats were autopsied on 11 th day and histological changes in surface epithelium, glands, and lamina propria were assessed. Proctitis showed significant improvement in surface epithelium (P<0.024), glands (P<0.000) and lamina propria (P<0.002) in group E compared to group B. Rats in group E showed significantly less change in glands (P<0.000) compared to rats in group D, All histological variables (surface epithelium, P<0.001; glands, P<0.000; lamina propria, P<0.003) compared to rats in group C. In a Tukey-b test, group E had a significantly recovered grade for glands (P<0.000) compared to groups B, C and D. Results of the present study showed that high-dose triphala improved radiation-induced damage of glands.

Zaveri, H., V. Rathva, A. Sant and D. Dave (2016). "Triphala: An Alternative Therapy in Periodontics–A Critical Review." Journal of Clinical Periodontology and Implant Dentistry **1**(1).

Zhao, Y., M. Wang, J. Tsering, H. Li, S. Li, Y. Li, Y. Liu and X. Hu (2018). "An Integrated Study on the Antitumor Effect and Mechanism of Triphala Against Gynecological Cancers Based on Network Pharmacological Prediction and In Vitro Experimental Validation." Integrative Cancer Therapies **17**(3): 894-901.

Objectives. Triphala is a herbal medicine that has been widely used for treating a variety of ailments. This study aims to systematically analyze the antitumor effects of Triphala on gynecological cancers. Methods. The antineoplastic activities of Triphala on gynecological cancers were analyzed using network pharmacology-based strategies. Afterward, the human ovarian cancer cell line SK-OV-3, cervical cancer cell line HeLa, and endometrial cancer cell line HEC-1-B were selected for experimetal valification. Results. Network pharmacology analysis suggested that Triphala could comprehensively intervene in proliferation and apoptosis through diverse signaling pathways, mainly including MAPK/ERK, PI3K/Akt/mTOR, and NF-κB/p53. The Cell Counting Kit 8 (CCK-8) assay illustrated that Triphala was able to inhibit cell proliferation with half inhibition concentration (IC50) values of 98.28 ± 13.71, 95.56 ± 8.94, and 101.23 ± 7.76 μg/mL against SK-OV-3, HeLa, and HEC-1-B cells, respectively. The ELISA experiment demonstrated that Triphala was capable of promoting programmed cell death, with dosage correlations. The antiproliferative and proapoptotic activities were confirmed by flow cytometric analysis using Ki67 antibody and Annexin V/propidium iodide (PI) dual staining. Western blotting revealed a decrease in expression levels of phospho-Akt, phospho-p44/42, and phospho-NF-κB p56 in cells administered Triphala, which indicated that the possible mechanism could involve downregulation of MAPK/ERK, PI3K/Akt/mTOR, and NF-κB/p53 signaling pathways, as was predicted. Conclusion. Triphala holds great promise for treating gynecological cancers. Although the favorable pharmacological properties have been preliminarily investigated in this study, further studies are still needed to uncover the sophisticated mechanism of Triphala in cancer therapy.

சிங்கம்

A Yajurvid ayurveda Publication